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A GIANT DINOSAUR FROM DURHAM DOWNS, QUEENSLAND.

BY HEBER A. LONGMAN, Director.

(Plates XXIX.-XXXIII.)

Introduction.—In February, 1924, Mr. Thomas Jack, of Dalby, and Mr. M. C. Wood, of Brisbane, informed me that a very large fossil was exposed on Durham Downs Station in the Roma District. As the result of correspondence, Mr. A. J. Browne, manager, forwarded fragments of vertebræ which were at once recognised as new to our collection. Subsequently Mr. Browne made arrangements to collect the whole of the remaining series as exposed in sandstone rock, amounting to about four cwt. of material. The specimens were packed in seven cases, and sent by motor lorry to Roma, and railed to Brisbane, where they were received at the Queensland Museum in May, 1925.

It is my pleasant duty very heartily to thank Mr. Browne for his great kindness in collecting, packing, and forwarding as a donation this valuable material.

Locality.—In response to my request Mr. Browne states that the exact location is as follows :—" About one-quarter of a mile on the south side of Eurombah Creek on Grazing Farm 1352A, Roma district, being portion 1v, parish of Narran, county of Aberdeen. The fossil is located in the north-west corner of the selection." Eurombah Creek is a tributary of the Dawson River.

Horizon.—Walloon Series, Jurassic, Freshwater. H. I. Jensen refers to the Durham Downs country as the " Lower Walloon or calcareous Walloon." He says that there is evidence of " a continued sweep of Lower Walloon strata from Taroom S.W. to Durham Downs, then W.N.W. to Boggarella."[1] In 1915, B. Dunstan, in his introduction to A. B. Walkom's study of our Mesozoic Floras, placed the Walloon Series as Jurassic, Freshwater, discarding the old term " Trias-Jura " as used by most earlier writers.[2] In a later paper[3] A. B. Walkom lists thirty-seven species from the Walloon Series and its equivalents, and states : " There is no doubt that the age of this flora is Lower Jurassic."

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[1] H. I. Jensen, Qld. Govt. Mining Jr., xxii., Oct. 1921, p. 403.
[2] B. Dunstan, Qld. Geol. Surv., Pub. No. 252, 1915, pp. 1-4.
[3] A. B. Walkom, Proc. Roy. Soc. Qld., xxxi, 1919, p. 15.

In 1923, H. I. Jensen states: "The Walloon Formations north of Roma have yielded no *Thinnfeldia*, and no large Tæniopteridæ. *Cladophlebis australis*, *Tæniopteris spatulata*, *Otozamites Feistmanteli*, and *Sphenopteris superba* were the principal fossils found in the Walloon in this area, the only others being fragments of Neocalamites and other Equisetales, *Ptilophyllum pecten*, *Dictyophyllum Davidi*, and seeds and spores. The Walloon Formations are Jurassic. . . ."[4]

The thickness of the Walloon Formations in the Roma district, as divided by Jensen (loc. cit., p. 157), is estimated at 5,000 ft. The Walloon Series and its equivalents are discussed by Bryan and Massey in a more recent paper.[5]

Material.—Over 100 specimens were forwarded, some of which are small shattered pieces. The main part consists of a series of twenty-two vertebræ, the majority of which were fractured, especially in the region of the neural arches. Owing to prolonged exposure some of the centra are much abraded on one side. There are also fragments representing central portions of the shafts of a femur, tibia, and fibula. In addition there are many smaller remains of pelvic elements, most of which are shattered into tiny pieces.

Matrix.—Mr. L. C. Ball, B.E., Deputy Chief Government Geologist, defines the matrix as "a very fine-grained, ferruginous, and highly calcareous sandstone, with attached masses of oxidised concretionary clay ironstone."

Great difficulty has been experienced in exposing the natural contours that were covered by matrix. In places the matrix forms a closely investing cement, much harder and less friable than the bone, and which, to use a mining term, is "frozen" to the surface of the specimens.

Previous Records.—This Durham Downs fossil is the first consequential discovery of a large Dinosaur in Australia, but there are three previous records of fragments. In 1891 H. G. Seeley described[6] *Agrosaurus Macgillivrayi*, "a Saurischian reptile from the N.E. Coast of Australia," believed to have been collected by Macgillivray during the voyage of the "Fly" from "some locality which was then unnamed," attributed doubtfully to the Trias. In 1906 A. Smith Woodward described and figured an "ungual phalange of a carnivorous Dinosaur," from the Lower Jurassic, Cape Patterson, Victoria, which was compared with *Megalosaurus* but unnamed.[7] The same author in 1909 recorded a "tooth and a posterior caudal vertebra of a small Megalosaurian" from "the Upper Cretaceous opal-bearing sandstone of Lightning Ridge, near Walgett, New South Wales."[8]

[4] H. I. Jensen, Proc. Linn. Soc. N.S.W., xlviii., 1923, p. 154.
[5] W. H. Bryan and C. H. Massey, Proc. Roy. Soc. Qld., xxxvii., 1925, p. 117.
[6] H. G. Seeley, Quart. Jr. Geol. Soc., vol. 47, 1891, p. 164.
[7] A. Smith Woodward, Ann. Mag. Nat. Hist. (7), vol. 18, 1906, p. 3.
[8] A. Smith Woodward, Rep. Brit. Assn., 1909, p. 482.

As will be seen from the descriptions, the Durham Downs specimens cannot be associated, for fairly obvious reasons, with the claw of a carnivorous Dinosaur from Victoria, and still less with the other two records.

Many comparisons have been made between our material and descriptions of Dinosaurs from other parts of the world, and, apart from the special significance of this discovery in Queensland, it is believed that the caudal vertebræ exhibit distinctive characters which require generic recognition. It may be remarked that Owen repeatedly pointed out the importance of vertebral characters,[9] and caudal vertebræ have been occasionally used for new generic and specific determinations. It is hoped, however, that additional remains, including cranial material, will be available later in order that other characteristics of this gigantic reptile may be made known.

Incidentally it may be mentioned that Leidy's genus *Antrodemus* was founded on the posterior half of a caudal centrum, with which C. W. Gilmore in 1920 associated *Allosaurus fragilis*.

RHŒTOSAURUS BROWNEI, new genus and species.[10]

Chief Characters.—Caudal vertebræ amphicœlous; anterior ones gigantic; centra solid, with expanded elliptical articulating surfaces, from which the body curves evenly to a median construction, which is more pronounced in the posterior elements; centra somewhat compressed laterally. Prezygapophyses elongated, the articulating surfaces being vertical and not obliquely horizontal (orthozygous). Postzygapophyses absent, but the hyposphene is well developed. Neural spines stout and not greatly elongated; anterior ones subrectangular in lateral outline, and with an oval median recess on the posterior margin above the junction with the hyposphene, which projects somewhat posteriorly; inferior border of hyposphene free, articulating between the prezygapophyses in the hypantrum area and roofing the neural canal. Anterior chevrons massive and not elongated, intervertebral in attachment and partly lateral in position; not confluent at their vertebral attachment; posterior chevrons more inferior in position. Neural canal relatively large in the anterior caudals.

Caudal Vertebræ.—Although many of the vertebræ are in two or more pieces, it has been possible to reconstruct the centra and to place in correct juxtaposition a series of sixteen units. This demonstrates the careful way in which the fragments were collected by Mr. A. J. Browne and his assistants.

The antero-posterior extent of these sixteen consecutive vertebræ is 9 ft., or 2 metres, 743 mm. When photographed this consecutive series was slightly

[9] "If I were restricted to a single specimen on which to deduce the nature of an extinct animal, I should choose a vertebra to work out a reptile, and a tooth in the case of a mammal."—R. Owen, Ann. Mag. Nat. Hist., ii., 1878, p. 216.

[10] From "Rhœtos," one of the giants in Greek mythology, sprung from the blood of Uranos. The specific name is in honour of Mr. A. J. Browne, of Durham Downs.

extended beyond this measurement, owing to difficulties of alignment (Plate XXIX.). In addition there are fragments representing at least six vertebræ in the posterior region. Judging from dimensions, one of these, to which is conjoined the anterior moiety of a second, should be placed in serial alignment near to No. 16 of our consecutive series.

In the anterior vertebræ there is an obvious difference between the antero-posterior diameter of the centrum, taken near the origin of the neural arches, and the diameter near the inferior margin. This suggests that the base of the tail had a pronounced downward curve, although the condition of the specimen and the amount of matrix between the centra prevent this from being manifested when the units are placed in juxtaposition.

The units in this series of consecutive vertebræ have been numbered from 1 to 16, whilst a more posterior vertebra is denoted as X. The dimensions of these are given in millimetres :—

Antero-posterior length of vertebræ—

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	X
140	136	137	135	135	140	142	160	150	158	150	152	158	157	155	?	157

Vertical height (taken at the anterior articulating surface from the inferior border to base of neural canal)—

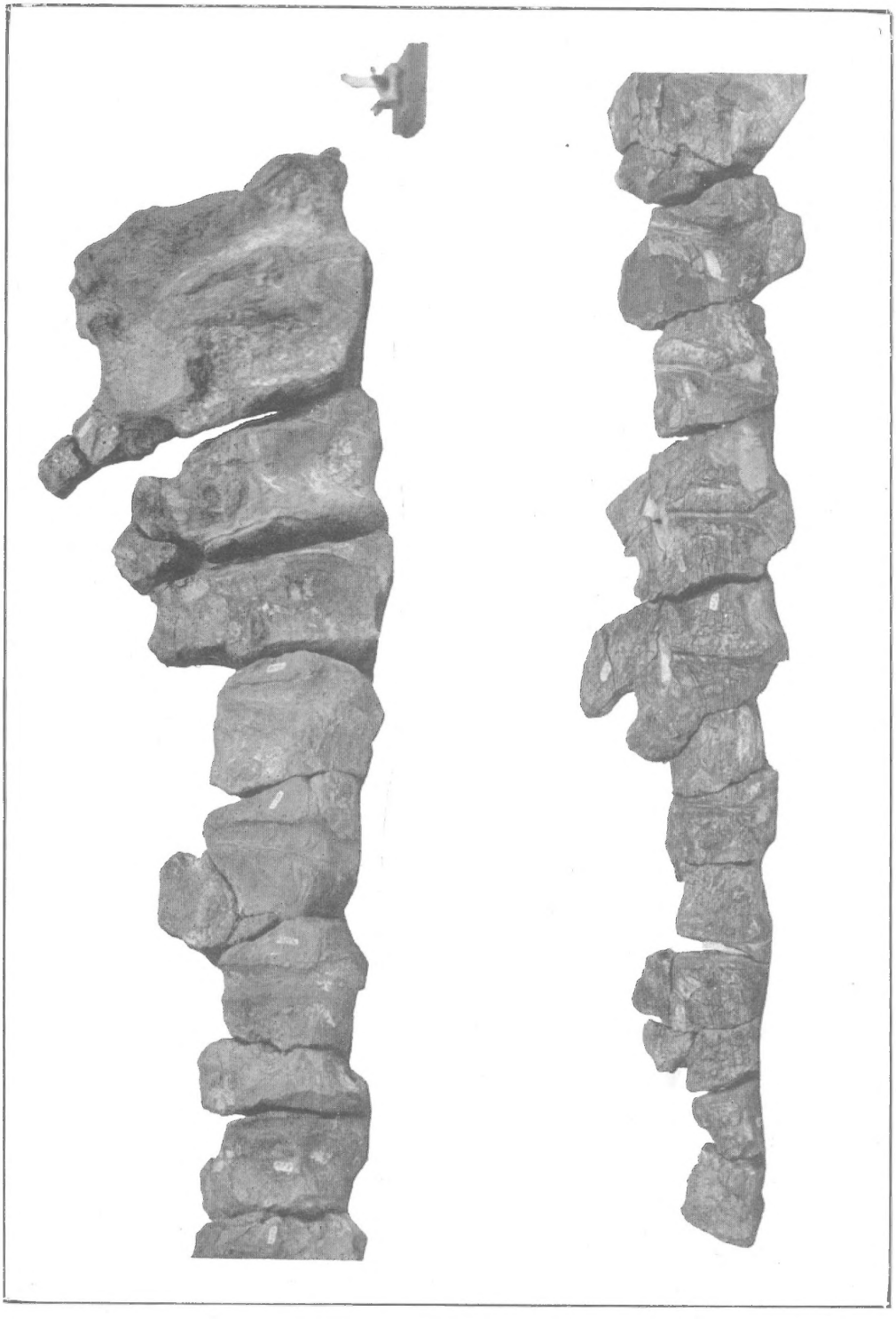
1	3	6	10	12	13	15	16	X
270	250	205	170	153	145	135	109	108

Measurements are given only of the units in which this area is best preserved. The height of No. 16 is taken at the posterior border.

Maximum transverse diameter of vertebræ at centre of articulating surfaces—

1	3	6	10	13	14	15	16	X
190	162	(?) 170	150	134	124	120	112	(posterior) 108

From the dimensions it will be seen that the tail of *Rhætosaurus* formed of a rapidly tapering series of bulky elements. The vertical height of the centrum of No. 1 of our consecutive series is almost double the antero-posterior length. No. 6 is only one and a-half times the length. In No. 12 the proportions are about equal, whereas the length of Nos. 16 and X is approximately one and a-half times the height. Although the anterior vertebrae are so large, this rapid tapering suggests that the tail was not greatly elongated beyond the elements actually represented. The presence of chevron bones on the both sides of the first of our series suggests that there was at least one additional anterior caudal, and there is also definite evidence in a large lateral fragment of a neural arch that cannot be allocated with the continuous series. Distally there were undoubtedly several smaller



Rhætosaurus brownei. Consecutive series of caudal vertebræ. Total length 9 ft. A caudal vertebra from *Crocodilus porosus* is shown on a small block for comparison.

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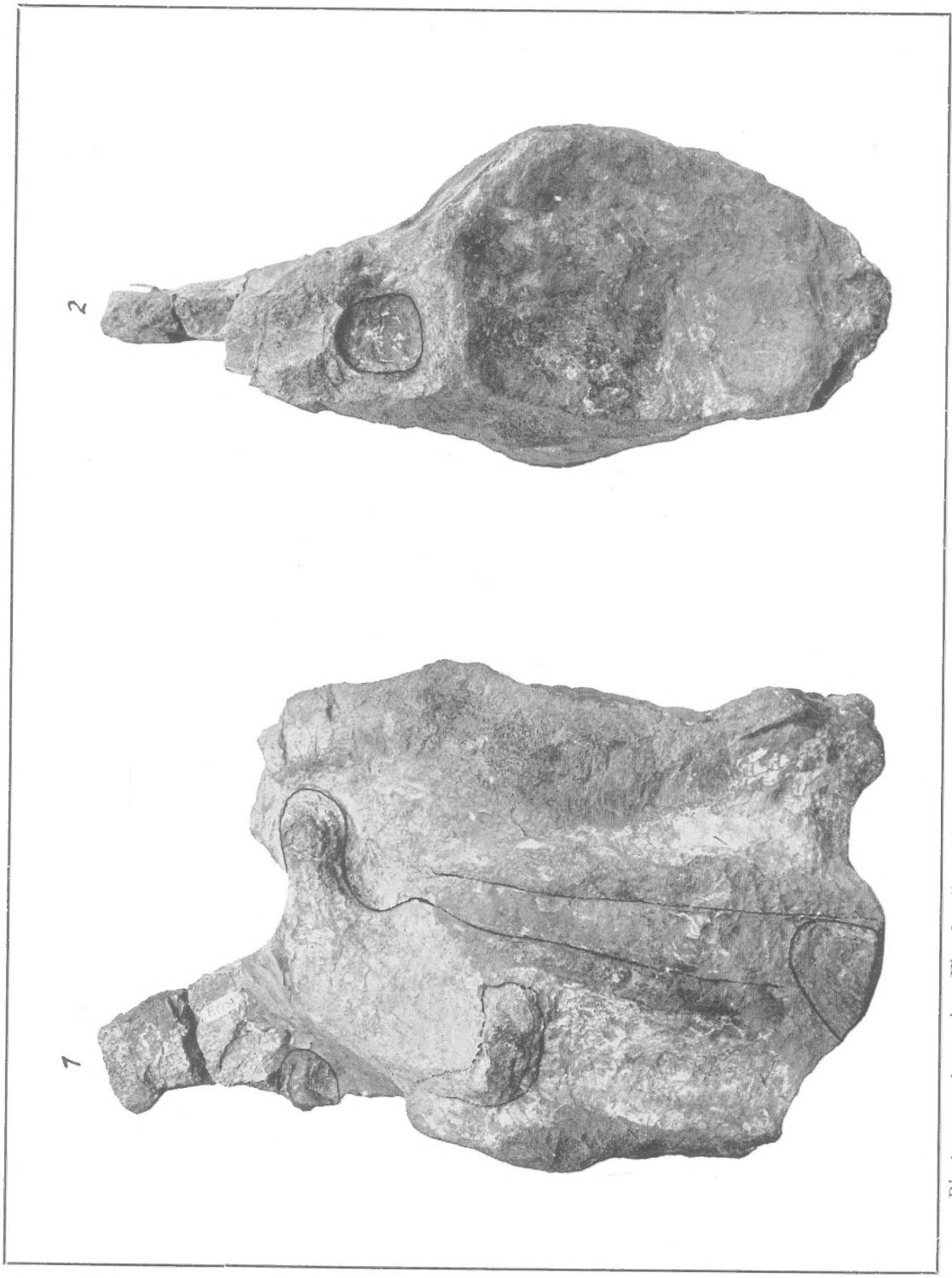

Rhætosaurus brownei. Fig. 1.—Lateral view of conjoined anterior vertebræ. Fig. 2.—Anterior face of first vertebra.

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vertebræ, but it is thought that the total number of caudal vertebræ was about thirty or thirty-five at most. It is assumed that there was no whip-like distal extension as in *Diplodocus*.

The inferior border of the centrum in the anterior vertebræ appears to have been obtusely keeled, but in the median and posterior units of our series it is smoothly rounded. In the lateral outline the inferior border is very concave, especially in the posterior vertebræ.

Chevrons.—On the anterior vertebræ these are somewhat thick, subtriangular plates, which do not appear to have had very elongated processes. The apex of the triangle lies within the groove between the articulating surfaces of the vertebræ, the infero-lateral margins of which diverge to accommodate the expanding plates. In one or two of the anterior vertebræ, the greater part of these sub-triangular bones lies within the plane of the centra, and it seems probable that the area of the hæmal canal must have been relatively small. Some of these chevrons, however, may have been forced upward during the process of fossilisation. The inferior borders of the chevrons are fairly straight, and, although they may be contiguous in the pairs preserved in position, there is no evidence of ankylosis. The contours of the inferior borders do not suggest lengthy inferior blades. In the series as a whole there is evidently considerable variation in the size, contours, and positions of the chevrons, and no one of the posterior elements is well preserved.

On the first two vertebræ the superior margin of the chevrons is obtusely rounded and the shape of the plate is thus more oval than sub-triangular (Plate XXXI., fig. 3). On vertebra No. 10 of our series the conjoined inferior margin of the chevrons is distinctly concave, and, in this respect, resembles those of *Cetiosaurus leedsi*[11] (Plate XXXI., fig. 2). On the posterior vertebræ, the chevrons, which are still sub-triangular, are more inferior in position and are contiguous beneath the centra. Here there is evidence of projections at the posterior angle.

The massive, short chevron plates of the anterior vertebræ with wide areas for intervertebral articulations appear to be very distinctive.

Neural Spines.—With the exception of that on one of the posterior vertebræ (No. 12 in our consecutive series), the neural spines are very imperfect, and it has been found possible to reconstruct only two of the anterior ones. The anterior spines slope backwards at an angle of about 130 degrees from the plane of the centra, and they attain an antero-posterior diameter of about 90 mm. and a transverse diameter of about 40 mm. Although the distal margins are incomplete it is evident that the height of the anterior spines was at least three times the antero-posterior diameter. Unp'aced fragments have apices which are truncated or broadly rounded in lateral profile, whilst the more posterior spines are acuminate in transverse profile.

[11] B. M. Guide Foss. Rept. and Fishes, 1905, Plate III.

The spines decrease in height and general bulk towards the end of the series; here they are much more obliquely set, the posterior margin is very concave, and the apex reaches a point above the middle of the subsequent vertebra.

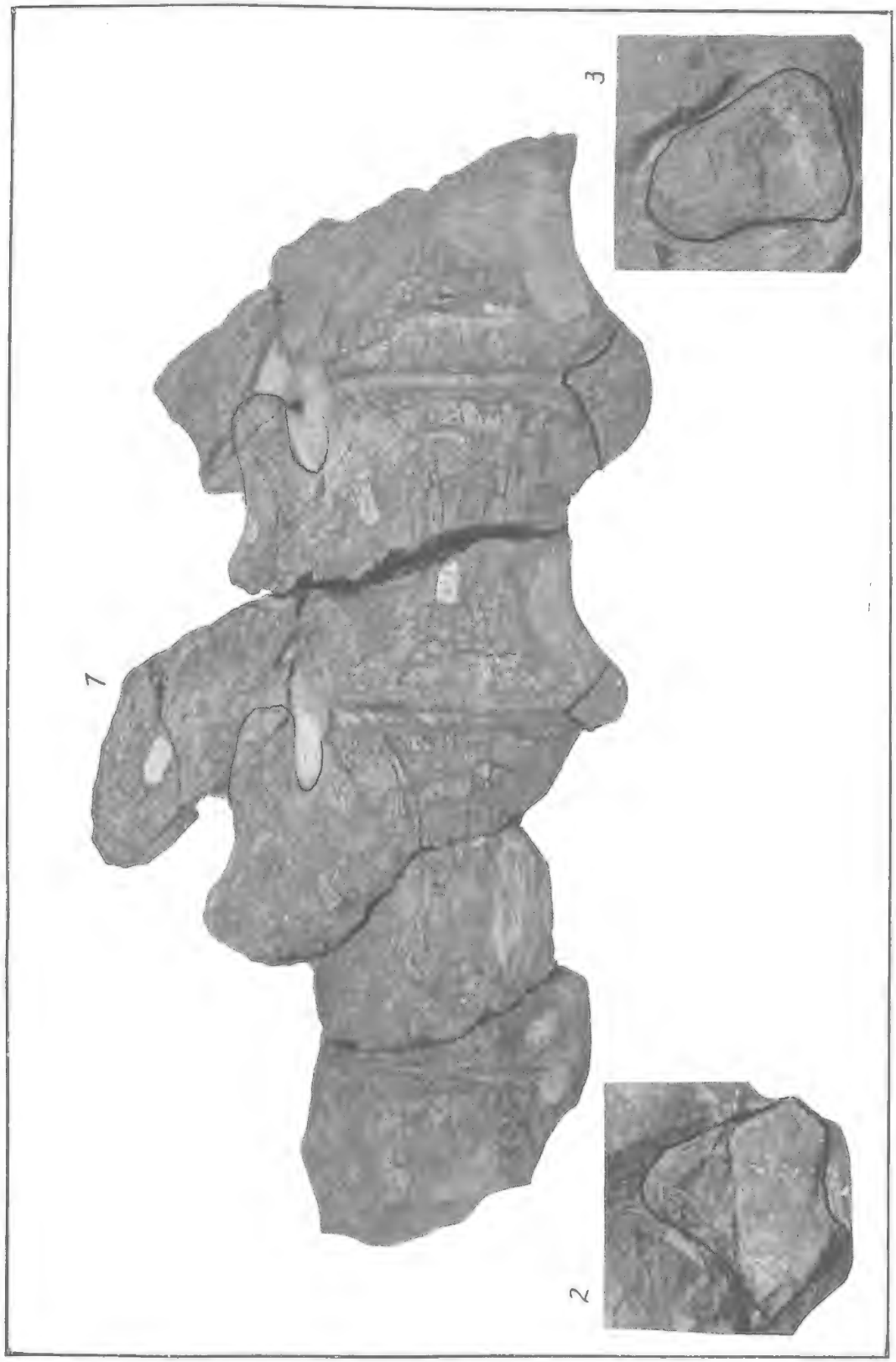
Included among the unplaced fragments are remains of several spines, but as they were obviously broken and abraded long before the fossil was collected it is impossible to place them in correct position. There is no evidence that any of the neural spines were emarginated distally, as in many of the anterior caudals of *Diplodocus*.

Transverse Processes.—Although none of the diapophyses are present, areas of fracture denote that the first six of our consecutive series carried transverse processes. The first vertebra is too much abraded to yield evidence of the extent of the processes. On the second vertebra the transverse processes were situated above the upper third of the centrum (Plate XXX., fig. 1). The fractured area denoted an antero-posterior length of about 70 mm. with a thickness of 30 mm., and the process was angulated posteriorly with a superior buttress. On the third vertebra the area of fracture is slightly lower in position and more oval, and the same applies to No. 4. The area of No. 5 is somewhat obscured; it resembles 4 but is lower in position. The sixth vertebra apparently carried a small transverse process, but there is no positive evidence on the seventh.

Neural Arches.—The neural arches are medially situated on the centra and are strong processes supporting prominent prezygapophyses, stout spines, a specialised hyposphene, but with no distinctive postzygapophyses. In the anterior vertebræ, the body of the neural arches occupies, in antero-posterior extent, about two-thirds of the length of the centrum, whilst the transverse diameter is about equal to half that of the centrum.

In the first three vertebræ, the prezygapophyses overlap the contiguous centrum and reach a point above the origin of the posterior part of the neural arch (Plate XXX., fig. 1). They are not quite horizontal in position, but project upwards somewhat, terminating in an obtuse apex, and in transverse section they are semi-circular, with the flat articulating surfaces vertically placed. In the more posterior vertebræ, as shown in Nos. 12 and 13, they do not project further than the intervertebral area and the arms are much compressed laterally. The transverse diameter of the neural arch at the articulating area is relatively small.

In the anterior vertebræ, the hyposphene projects backwards from the infero-posterior border of the neural spine and overlaps the inter-vertebral area and terminates just beyond this point. As may be seen from exposed cross-sections, its lateral contours are adapted to the curved recess between the arms of the prezygapophyses (Plate XXXII., figs. 1 and 2). Its inferior border, as distinct from the lateral areas, does not articulate with any



Rhætosaurus brownei. Fig. 1.—Vertebræ 12 and 13 with moieties of Nos. 11 and 14. Figs. 2 and 3.—Chevron plates.

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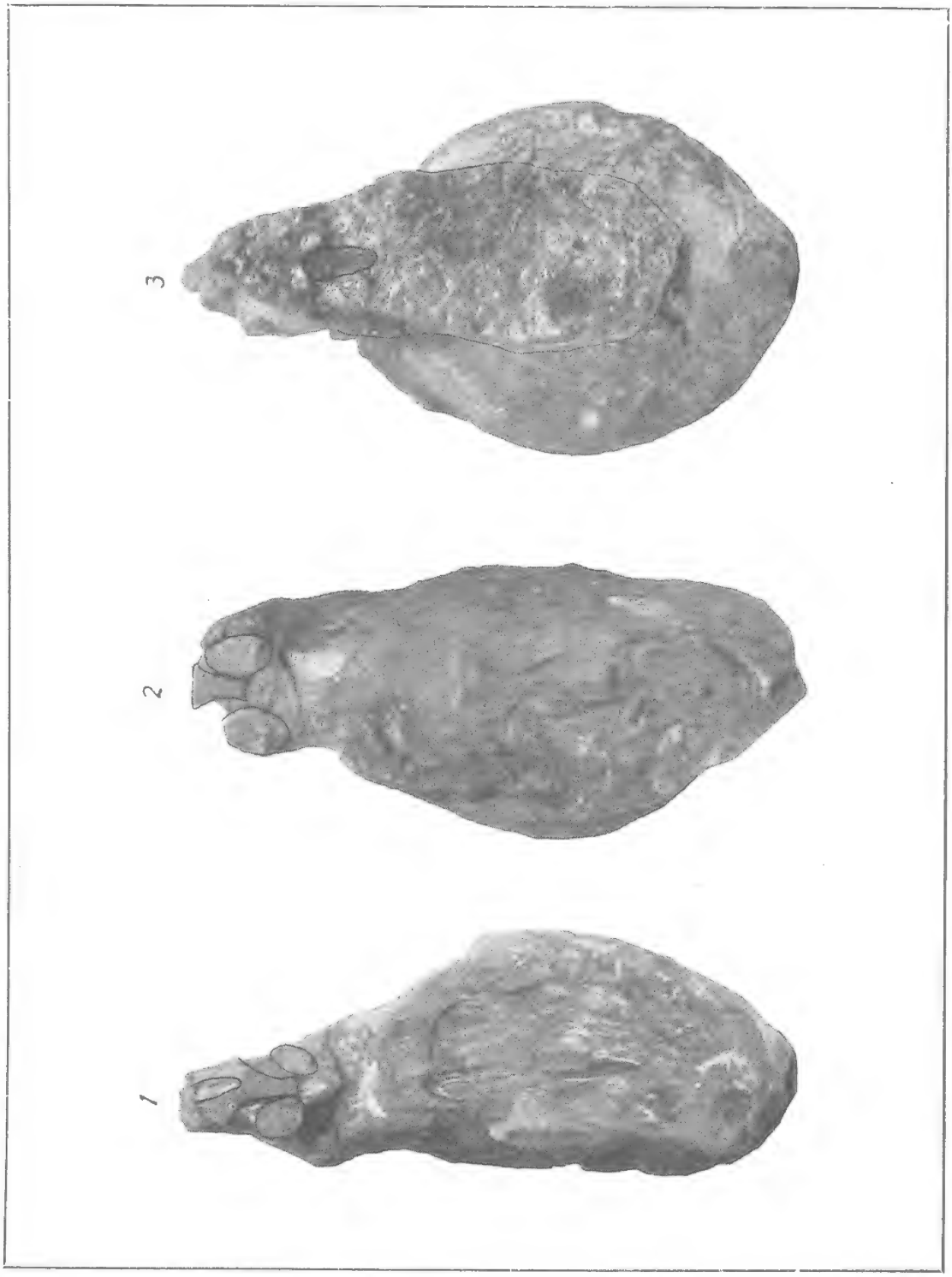

Rhœtosaurus brownei. Fig. 1.—Posterior face of 3rd vertebra. Fig. 2.—Anterior face of 4th vertebra.
Fig. 3.—Area of fracture of 12th vertebra.

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projecting processes on the contiguous vertebra, but it roofs over the neural canal for the extent of its projection. Immediately above the hyposphene is a prominent elongated oval recess which is continued upwards into the median portion of the posterior border of the spine. This recess cannot be interpreted as a zygantrum and could not have functioned as such (Plate XXXII., fig. 1).

In the posterior vertebræ, judging from the units in which this area is available for study, the structure is simpler. The hyposphene projects backwards over the neural canal and is embraced laterally by the projecting arms of the prezygapophyses, which are thin and tapering in this region, but there is no noticeable median recess in the posterior edge of the neural spine. Owing to the oblique position of the spine, the hyposphene, in the region of Nos. 12 and 13 of our series, may project backwards for one quarter of the length of the contiguous vertebra (Plate XXXI., fig. 1).

The hyposphenal articulation may be compared with that of *Camarasaurus supremus* Cope, as described and illustrated by Osborn and Mook in their magnificent monograph,[12] although no close relationship is suggested between the two. As in the American reptile, the hypantral articulation surfaces are continuous with the prezygapophyses, but in *Rhœtosaurus* the inferior border of the hyposphene is not so extended and expanded below as in the articular complex figured by Osborn and Mook (Fig. 40, p. 303), for the dorsal vertebræ of *Camarasaurus*. Illustrations of the articulation of *Rhœtosaurus* in cross-section, as exposed by fracture, are given in Plate XXXII., but the region is somewhat distorted.

It is practically certain that this simple and probably primitive method of articulation had a far more complex development in the missing dorsal series. In our caudal specimens the hyposphene is a median wedge, relatively narrow in transverse section, and is not associated with a complex hypantrum. The writer has followed Zittel (Text-book of Palæontology, English trans., p. 224) in considering the hyposphene as "a vertical or wedge-shaped projection occurring on the posterior end of the neural arch below and continuous with the postzygapophyses." There appears to be no uniformity in the use of these terms, however, for R. S. Lull, in his fine monograph on *Barosaurus*, describes the hyposphenes as a development from the anterior portion of the neural spine, probably owing to the special architecture of the articulating complex under review; and Marsh apparently takes this view in describing *Brontosaurus*.

The remarkable form of articulation in *Rhœtosaurus brownei* must have been associated with some specialisation in tail movement and function. There could have been little lateral movement of the individual vertebræ, except in a lengthy series, especially in the anterior region. Moreover, the unusual posterior extension of the hyposphene, roofing the neural canal, makes it difficult to conceive of vertical movement, except of the greater part of

[12] Osborn and Mook, Mem. Amer. Mus. Nat. Hist., n.s. iii., 1921.

the tail in unison. Judging from the architecture of articulation, combined with the size and solidity of the centra, and the bulky chevrons, it seems that the huge tail of this Australian Dinosaur was somewhat rigid and may have acted as a tripod with the immense hind legs. This does not necessarily indicate close relationship with the Iguanodontidæ. The actual weight of the specimens is remarkable, and the very incomplete vertebra No. 3 is no less than 27½ lb.

Neural Canal.—This is situated above the superior borders of the centra and does not lie in an excavated groove. In the first vertebra the neural canal is sub-oval in section and is very large, the vertical diameter being 53 mm. and the transverse 44 mm. (Plate XXX., fig. 2). In No. 7 the diameters are 35 and 20, in No. 12 they are 27 and 10, and in No. 15 they are reduced to 20 and 14.

Articular Surfaces.—These are amphicœlous throughout, but the concavity is much more marked in the anterior units. On the first vertebra the maximum depth of the concavity is at least 40 mm. behind the plane of the peripheral articulating surface (Plate XXX., fig. 2).

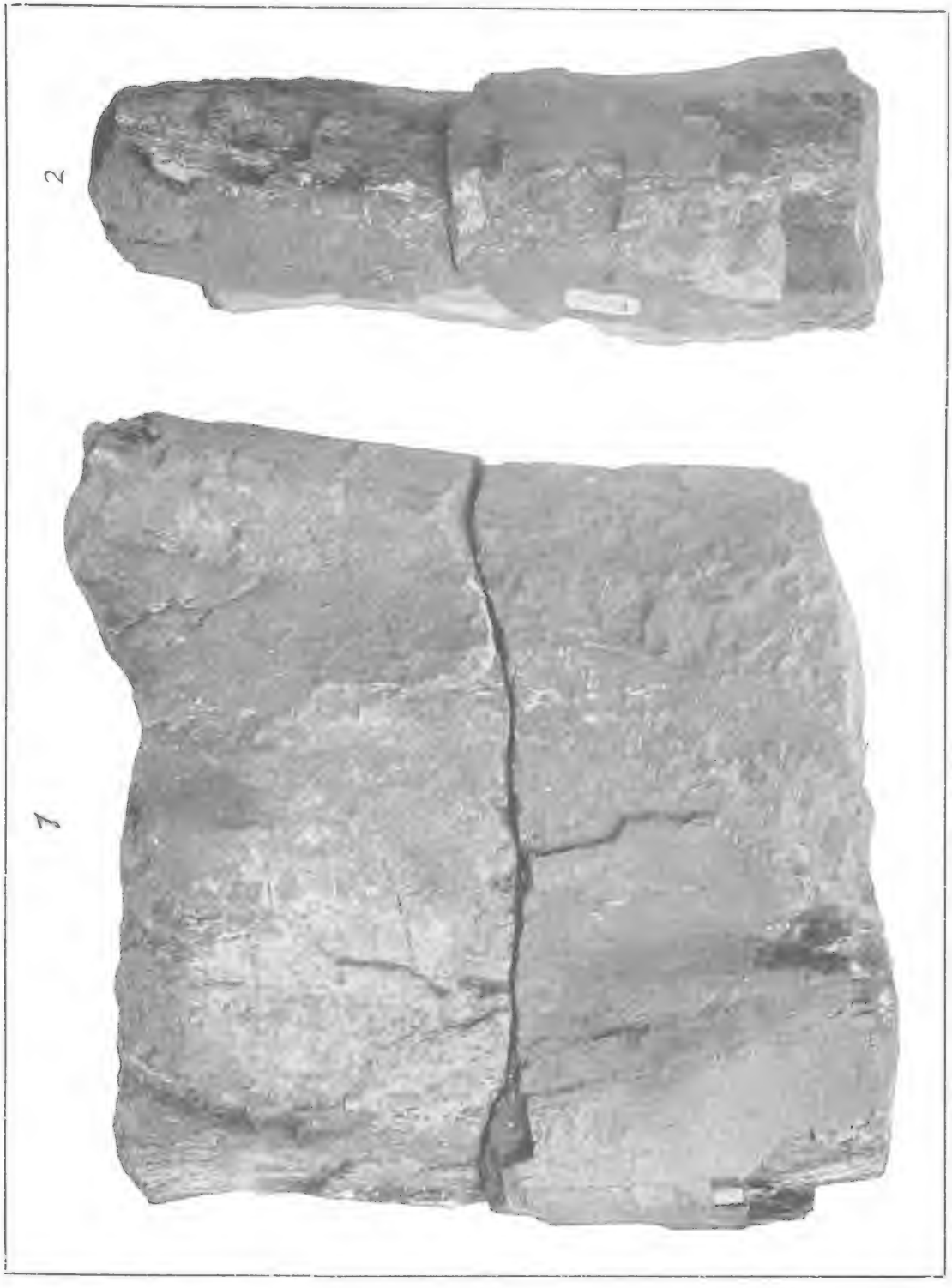
Marsh points out that the enlargement of the neural canal in the sacral region of *Stegosaurus* and some other Dinosaurs, the so-called "posterior brain case," is usually associated with "the great development of the posterior limbs."[13]

There are no very clear signs of the persistence of the neuro-central sutures, but the fact that the arches, or neurapophyses, are broken off in this region in several of the units suggests that it would be more obvious in less mature specimens.

Pelvic Fragments.—There are numerous fragments that are attributed to the pelvic girdle, but they do not present any consequential evidence. The majority of these remains are small, shattered fragments and one or two of the larger specimens are much abraded. A small series representing part of a shaft has been put together; this is sub-oval in section, with one face flattened, and has a maximum diameter of 110 and a circumference of 245 mm. Other fragments, which probably belong to the same shaft, are sub-triangular in cross-section, two of the surfaces being flattened and forming almost a right angle, and the other surface being very concave. This concave surface or valley gradually becomes more shallow as it approaches the more oval section of the fragments. Another much abraded fragment presents evidence of a strong ridge arising on a broad shaft. These fragments are believed to be remains of an ischium.

Femur.—Owing to the fragmentary nature of this specimen, but little significance can be attached to the femur, but its dimensions suggest a very large bone (Plate XXXIII., figs. 1 and 2). The fragment is apparently from

[13] O. C. Marsh, Dinosaurs of N. Amer., 16th Ann. Rep. U.S. Geol. Sur., 1896, p. 190.



Rhætosaurus brownei, Fragment of Femur Shaft. Fig. 1.—Lateral view, two-fifths natural size. Fig. 2.—Posterior view.

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near the middle of the shaft, and unfortunately no special features are available for comparison with other Dinosaurian femora. There is no sign of the fourth trochanter. This shaft fragment is oval in section and is 295 mm. or 11½ in. in length; the diameters are 300 and 90 mm., and the maximum circumference is 710 mm. or 28 in. In cross-section the major surfaces of the shaft are somewhat concave. The bone is fairly dense, except where abraded, and there is no evidence of a medullary cavity. This fragment represents a bone which is quite as large as, if not larger than, the femur of *Cetiosaurus* figured by Phillips, which was 64 in. in total length.[14]

A fragment attributed to part of the shaft of a tibia is much abraded, but has a circumference of approximately 20 in. or 510 mm. It presents no special features. There are two other fragments of a long bone which are believed to be portions of a fibula, but these are too small to warrant precise description, and the contours of the cross-section of the shaft are incomplete.

Affinities.—In the absence of cranial and pedal material it is difficult to give definite affinities for this Australian Dinosaur. The pelvic fragments are too incomplete to afford significant evidence, and in view of the importance of this region, as emphasized by the researches of Huxley, Seeley, Marsh, Baur, Abel, A. S. Romer, Nopcsa, von Huene, Osborn, Gregory, and Camp, and others, this is most unfortunate. Owing to the immense variety within the Dinosaurian assemblage and the evidence for convergent structures in families that are not closely related, resemblances in the characteristics of caudal vertebræ may be misleading. In so far as literature and descriptions are available many comparisons have been made, some of which are set out as follows :—

The very bulky solid vertebræ, with what may be called an orthozygous articulation suggesting comparative rigidity, together with the solid shafts of the long bones, make it almost certain that this Australian Dinosaur was a slow-moving herbivorous reptile, and the carnivorous Theropoda may thus be eliminated from consideration.

Although it is not improbable that the bulky tail acted as a tripod with hind legs that were relatively large compared with the fore limbs, it is not considered that *Rhætosaurus* should be associated with the Iguanodontidæ. It may be noted, however, that the vertebræ of such different reptiles as *Iguanodon* and *Cetiosaurus* have been confounded by the earlier authorities, and that new types of Iguanodonts from Mongolia have been recently recorded by Osborn.

The following comparisons may be of interest :—The dimensions of the caudal vertebræ of *Rhætosaurus* considerably exceed those of the vertebræ of *Iguanodon* as recorded by J. W. Hulke.[15] They also much exceed the caudal

[14] J. Phillips, Geol. of Oxford, 1871, p. 281.

[15] J. W. Hulke, Quart. Journ. Geol. Soc., vol. 38, 1882, p. 142.

vertebra first figured by Owen as "*Pelorosaurus Conybeari*,"[16] the dimensions of which (length 102, vertical diameter 225, transverse diameter 198 millim.) are given by Lydekker, who refers it to *Iguanodon*.[17]

As the length of *Iguanodon bernissartensis* is estimated at 33 ft., judging from these proportions *Rhœtosaurus* attained at least 40 ft.

The Durham Downs vertebræ, however, differ greatly from those of *Iguanodon*, which, according to Hulke, have postzygapophyses and a relatively small neural canal. The elongated chevron bones of *Iguanodon* are very distinct from those of *Rhœtosaurus*, and the limb bones of the former were hollow.

The specialised characters of the spines and the dermal armature of the Stegosauridæ widely separate this group from the Australian Dinosaur.

Rhœtosaurus should probably be placed in the Sauropoda, and in certain respects it presents resemblances to the caudal vertebræ of *Cetiosaurus* (*Cardiodon*), as described by Phillips.[18] The centra, however, are more elliptical and the postzygapophyses are absent, being reduced to mere indents on the postero-lateral areas of the neural spines.

Although the vertebræ as a whole do not closely resemble those of *Camarasaurus*, the somewhat similar type of hyposphenal articulation, previously noticed, may be significant. The American reptile, which attained over 57 ft., has somewhat larger vertebræ and postzygapophyses are present.

From the gigantic caudal vertebræ, first figured by Falconer[19] and subsequently described by Lydekker as *Titanosaurus indicus*,[20] our specimens are readily distinguished by being amphicœlous instead of procœlous. The caudal vertebræ of *Rhœtosaurus* are exceeded by those of *Atlantosaurus Camarasaurus* ?), one of which is recorded by O. C. Marsh as being "over 16 in. (420 mm.)" in transverse diameter.[21]

It is obvious that *Rhœtosaurus* has no close affinities with *Diplodocus*, which, as described by Hatcher,[22] has supplementary buttresses or laminæ and cavities in the centra; or with the East African giant *Tornieria* (or *Gigantosaurus*), which is said to be related to the lengthy American reptile. For similar reasons it cannot be closely compared with *Barosaurus*, as monographed by R. S. Lull,[23] or with Cope's *Amphicœlias*. Our vertebræ are

[16] Owen, Foss. Rept. Weal. Purb., Supp. 2, Pl. XI.
[17] Lydekker, B. M. Catal. Foss. Rept. Amph., i., 1888, p. 208.
[18] J. Phillips, Geology of Oxford, 1871, p. 260.
[19] H. Falconer, Pal. Mem., i., 1868, Plate 34.
[20] R. Lydekker (Mem. Geol. Surv. India (4), vol. i., p. 20).
[21] O. C. Marsh, Amer. Journ. Sci. (3), xv., 1870, p. 242.
[22] T. B. Hatcher, Mem. Carnegie Mus., i., 1901, p. 35.
[23] R. S. Lull, Mem. Conn. Acad. Sci., vi., 1919.

very dissimilar from those in the *Brontosaurus* group, with a relatively light vertebral column, centra with lateral cavities and cruciform spines, as described by Marsh.[24]

As Owen's *Cetiosaurus* is apparently a synonym of *Cardiodon*,[25] the old Family Cetiosauridæ—which, according to Zittel,[26] includes the Mosasauridæ and Atlantosauridæ of Marsh—is displaced by Cope's Camarasauridæ. With certain qualifications, mainly due to the inadequacy of our material, *Rhætosaurus* may be placed in this family for time being.

Dinosaur or Saurischian.—F. R. von Huene has come to the conclusion that the Dinosauria are not of monophyletic origin and that Owen's term Dinosauria "should be abandoned absolutely."[27] Following H. G. Seeley, but with far greater wealth of material and opportunity for research, he divides the old order into two groups: Saurischia (= Theropoda + Sauropoda) and Ornithischia (= Orthopoda). Williston considers that this separation "has much to commend it,"[28] and W. D. Matthew endorses it.[29] The word "Dinosaur" is so generally adopted in literature, however, that the writer has preferred to use it in the description of this new Australian material, and there appear to be many reasons for the retention of Owen's term for at least part of this immense reptilian assemblage.

Conclusion.

The fossils from Durham Downs give definite evidence of a gigantic herbivorous Dinosaur from Jurassic deposits in Queensland, with distinctive characters in its caudal vertebræ, as outlined in this paper. This has been named *Rhætosaurus brownei* and has been tentatively placed in the Family Camarasauridæ of the Sauropoda. This reptile was a bulky, herbivorous quadruped, with dominant hind limbs, a somewhat rigid tail, and probably attained over 40 ft. in length.

In view of the prodigious variety of Dinosaurian forms recorded from other parts of the world, illustrating the "bizarrerie" of nature to a degree unsurpassed by any other group, it will not be surprising if many additional forms are found in the future in Australian deposits.

[24] O. C. Marsh, The Dinosaurs of N. Amer., 16th Ann. Rep. U.S. Geol. Surv., 1896, p. 171.
[25] L. P. Bush, Amer. Journ. Sci., xvi., 1903, p. 96.
[26] Zittel's Text-book of Palæontology, Eng. edition, ii., 1902.
[27] F. R. von Huene, Amer. Journ. Sci., (4) xxxviii., 1914, p. 145.
[28] S. W. Williston, Rep. from Journ. Geol., xxv., 1917, p. 414.
[29] W. D. Matthew, Ann. Rep. Smith. Inst., 1923, p. 279.

EXPLANATION OF PLATES.

Plate XXIX.

Consecutive series of caudal vertebræ of *Rhætosaurus brownei*, photographed in juxtaposition, total length 9 ft., or 2 metres, 743 mm. (Owing to the abraded surfaces it was found impracticable to photograph the left side—the more usual position.)

Plate XXX.

Fig. 1.—Conjoined vertebræ 1 and 2 of *Rhætosaurus brownei*, showing prezygapophysis, area of fracture of transverse process, and incomplete chevron. The anterior vertebra is much abraded.

Fig. 2.—Anterior face of vertebra 1 of *Rhætosaurus brownei*, showing very concave articulating surface and large neural canal.

Plate XXXI.

Fig. 1.—Vertebræ 12 and 13 with moieties of Nos. 11 and 14, showing typical orthozygous articulation of *Rhætosaurus brownei*.

Fig. 2.—Chevron plate between vertebræ 10 and 11, with concave inferior margin.

Fig. 3.—Chevron plate from left side, between vertebræ 1 and 2.

Plate XXXII.

Fig. 1.—Posterior face of third vertebra of *Rhætosaurus brownei*, showing hyposphene with median recess above and section across prezygapophyses of contiguous vertebra.

Fig. 2.—Anterior face of fourth vertebra showing section across hyposphene and prezygapophyses, contiguous with Fig. 1 (area distorted).

Fig. 3.—Area of fracture of vertebra 12, showing laterally compressed mid-region of centrum and neural canal.

Plate XXXIII.

Fig. 1.—Lateral view of fragment of femur shaft of *Rhætosaurus brownei*. Two-fifths natural size.

Fig. 2.—Posterior view of femur-shaft fragment.

THE CRETACEOUS *AMMONOIDEA* OF EASTERN AUSTRALIA.

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GEOLOGICAL SURVEY OF QUEENSLAND.

(Plates XXXIV.–XLI.)

CONTENTS.

INTRODUCTION.

The present paper is an attempt to revise the ammonite fauna of the "Rolling Downs Formation" of Eastern Australia in the light of recent palæontological work in other countries. Hitherto no comprehensive attempt has been made to establish and correlate palæontological horizons within the formation; and it is to be hoped that the present review may serve as the basis of a more minute treatment of the whole fauna.

For very many years almost the sole worker on the fossils of the "Rolling Downs" has been the late Robert Etheridge junr. His patient,

detailed and richly illustrated work has paved the way towards a zonal treatment of the fauna; and the writer is deeply indebted to the fine series of monographs which Etheridge produced on the Cretaceous Palæontology of Australia. It is no reflection upon the work of Etheridge that in this paper, in accordance with recent developments, more modern generic determinations are used. Etheridge keenly appreciated the generic analyses of the mesozoic cephalopods; and much of the effective work on the Lower Cretaceous lineages has been done since the appearance of his last important paper on the Australian forms (1909).

The present examination, which has been carried out in the Sedgwick Museum, Cambridge, has been made possible largely by a grant from the University of Queensland. The material used has been drawn mainly from the collections of the Queensland Museum, Australian Museum and British (Natural History) Museum. To all these institutions the writer expresses his gratitude. To Mr. H. A. Longman, Prof. H. C. Richards, Mr. W. H. Bryan and Sir Edgeworth David for constant interest in the progress of the work; to Mr. H. Woods for general advice; to Mr. A. G. Brighton for critical and other assistance; and particularly to Dr. L. F. Spath for much ever-ready help and kindly criticism he is deeply indebted.

STRATIGRAPHICAL AND GENERAL RESULTS.

Within the "Rolling Downs" two main series are apparent, which on both lithological and palæontological grounds are markedly distinct. The lower, to which the name *Roma Series* is now given, comprises the group of bluish clays (mainly) with calcareous concretions; the upper, for which the name *Tambo Series* is proposed, consists mainly of yellowish limestones often with cone-in-cone structure. Both series are widely distributed.

A. MORVEN BED.—The one specimen containing *Simbirskites spp.* is all the evidence so far available of this bed, which is the oldest marine mesozoic horizon known in Eastern Australia. It indicates the presence of the Simbirskitan stage of the Hauterivian.

B. ROMA SERIES.—The ammonite genera recorded from this series are: *Parahoplitoides* (?), *Aconeceras*, *Sanmartinoceras*, *Australiceras*,[1] *Tropæum*, *Toxoceratoides* and *Aioloceras*.[1] Three palæontological divisions are possible:—

iii. Beds with *Sanmartinoceras* and *Aioloceras*;

ii. Beds with *Tropæum* and *Aconeceras walshense*;

i. Beds with *Australiceras* and *Toxoceratoides*.

As mentioned below the genus *Australiceras* is first known with certainty in the *bodei* zone of the Bedoulian (Lower Aptian) and is replaced in the *hillsi* zone of the Lower Gargasian by *Tropæum*. The beds with *Australiceras*

[1] New genera (v. inf.).

correspond therefore to the Upper Bedoulian. Whether any of the Lower Bedoulian is present is uncertain. The four zones of the Upper Bedoulian (*bodei*, *weissi*, *hambrovi* and *consobrinoides*) cannot be recognised at present, though *Australiceras robustum* is probably low zonal while *A. transiente* most probably occurs at the top of the beds.

The beds with *Tropæum* naturally correspond to the Tropæuman of Europe (Lower Gargasian). Species of *Tropæum* are abundant, the only other genus recorded being *Aconeceras* (*A. walshense*).[2] As mentioned below the vertical ranges of *Australiceras* and *Tropæum* may overlap, so that there may be a very indefinite junction between these two divisions.

The highest division of the Roma Series has yielded *Aioloceras jonesi*, *Sanmartinoceras fontinale* and *S. olene*. *Sanmartinoceras* is restricted to the top of the Gargasian; while *Aioloceras*, from its position in the section in Patagonia, is apparently also Upper Gargasian.

If the deposition of the Roma Series was continuous, then the series ranges at least from the *bodei* to the *aschiltaensis* zone of the Aptian (*Sanmartinoceras* defines the latter zone). But there is no evidence at present that it extends into the Lowest Albian as it may do in the central (concealed) portion of the area. Ammonites from all three divisions have been found in the Queensland areas; but in New South Wales and South Australia the upper division only has yielded ammonites (*Parahoplitoides? sp.*, however, from South Australia may be from the lower (*Australiceras*) division). But the evidence, to be published later, of the other elements of the fauna shows that all three divisions are well represented in these States.

C. MARYBOROUGH BEDS.—As shown by Richards (**82**, p. 182) and others these beds are composed of a lower (sandstone) and an upper (chert) division. The sandstones have yielded fragments of *Australiceras jacki* but no ammonites are known from the cherts. The sandstones, therefore, from their ammonite remains correspond to part of the lower division of the Roma Series. The writer hopes to show in a later paper, when considering the Lamellibranchs, that the whole of the Maryborough Marine beds are to be correlated with the *Australiceras* beds of the Roma Series.

D. TAMBO SERIES.—The ammonite genera recorded from the Tambo Series are: *Puzosia*, *Beudanticeras*, *Prohysteroceras*, *Inflaticeras*, *Hamites*, *Anisoceras*, *Labeceras*,[3] *Appurdiceras*,[3] *Myloceras*,[3] *Aleteceras*,[3] and *Flindersites*.[3]

The species of *Prohysteroceras* and *Inflaticeras* are shown to be characteristic of the upper *orbignyi* and the *varicosus* zones of the Upper Albian and the specimens are preserved in a deep yellow, marly limestone. Specimens

[2] *Aconeceras walshense* is placed in this division from the agreement of its matrix with that of *Tropæum rarum* rather than with that of the species of *Australiceras* from the same locality.

[3] New genera (v. inf.).

of *Flindersites baccatus*, *Aleteceras plectoides*, *A. tardicostatum*, *A. nautiloides*, *Myloceras ammonoides*, *M. davidi*, *Labeceras bryani*, *L. compressum*, *Puzosia longmani*, etc., also occur in this type of matrix and no doubt represent the same horizon.[4] The matrix of the specimens examined of *Beudanticeras flindersi*, *B.* (?) *daintreei*, *Flindersites intermedius*, *Myloceras orbiculus*, *Hamites* aff. *maximus*, etc., is rather lighter in colour. This may represent local variations of the other matrix or may point to a slightly different horizon for these species. Since the species of *Beudanticeras* and *Hamites* do not give any very definite indication of their zonal position within the Upper Albian, it is tentatively assumed that these species represent the same horizon as *Prohysteroceras richardsi*, etc.

The position of the Tambo Series is, therefore, Upper Albian, and at present there is no evidence of more than the *orbignyi* and *varicosus* zones being present.

CONVENTIONS.

The nomenclature used throughout this paper for specific descriptions is that of Buckman (**11**) and Spath (**101**, p. 7). The terms "crioceratid," "ancyloceratid," etc., are used to denote types of coiling and not to indicate relationships with the genera *Crioceras*, *Ancyloceras*, etc.

Dimensions are given according to the generally adopted plan instituted by Buckman, where the first numeral gives the diameter in mm., the other three numbers being (in order) the whorl-height, whorl-thickness and width of umbilicus, reckoned as percentages of the diameter. Where a number is inserted in brackets after the first numeral, as e.g. in the topotype of *Aconeceras walshense*, the first number is the maximum diameter noted, while that in brackets is the diameter at which the other dimensions are taken. The Greek letter ϕ is attached in such cases where the measurements are taken from a published figure and not from the actual specimen.

In comparing fragments of crioceratids the writer proposes an additional method of measurement. Two numbers are given (as in the case of *Aleteceras tardicostatum*), the first of which is the maximum height of whorl in mm., and the second is the width of whorl given as a percentage of the height. Such measurements are prefixed by the Greek letter θ. In cases where measurement is made from a published figure and not from the original specimen the letter ϕ is used as well (see *Tropæum leptum*).

The zonal nomenclature used is that of Dr. Spath (**99** and **100**), to whose comprehensive and detailed work on the Cretaceous the author is particularly indebted.

[4] A specimen of *Flindersites baccatus*, in the writer's collection, is associated, in the hand specimen, with *Prohysteroceras richardsi*.

The following abbreviations have been used to indicate the collections in which types and other specimens are lodged :—

A.M.—Australian Museum (Sydney).
B.M.—British Museum (Natural History).
F.W.W.—The author's collection.
G.S.Q.—Geological Survey of Queensland.
G.S.S.A.—Geological Survey of South Australia.
Q.M.—Queensland Museum.
N.M.—National Museum (Melbourne).
M.G.M.—Mining and Geological Museum (Sydney).
M.M.—Macleay Museum (University of Sydney).
R.D.—Daintree Collection (now in the Queensland Museum).
U.Q.—University of Queensland.

ON HETEROMORPHIC AMMONOIDEA.

Probably the most notable feature about the ammonoid faunas of the Cretaceous of Eastern Australia is the profusion of heteromorphic forms. Yet, strangely enough, no helicoid genus has been found in these beds. Many of the genera present are inadequately known from other areas, and consequently Etheridge, who appreciated fully the richness of the fauna in these aberrant types, left them all provisionally in *Crioceras* sensu lato.

According to the theory of cyclical development, crioceratid forms were regarded as the phylogerontic stage of cycles of genera all with more or less the same general trend. But the recent work of Spath and Salfeld has cast grave doubts on this theory, and has shown that it is far more probable that the two persistent leiostrachous stocks, *Phylloceratidæ* and *Lytoceratidæ*, have been the main sources from which the transient waves of the normal trachyostrachous ammonoids have developed. *Lytoceratidæ* and *Phylloceratidæ* in most features are at opposite extremes—the one being extremely evolute with a septal suture having the minimum number of major indentations, the other with highly involute whorls and a septal suture with a profusion of accessory lobes. Crioceratid forms could be produced from these stocks in three main ways :—

(1) They may be end points of offshoots from *Phylloceratidæ*, the lineages having passed through all degrees of normal volution on the way ;

(2) They may be derived directly from *Lytoceratidæ*, which, in their extreme involution, are but one step removed from crioceratid coiling ; or

(3) They may be derived indirectly from *Lytoceratidæ*, occurring at a late stage in a lineage which has passed through other modifications before developing " uncoiled " forms.

It might naturally be expected, therefore, that most crioceratids are directly derived from *Lytoceratidæ*, and the essential simplicity[5] of the venter

[5] Fastigate, carinate, or sulcate forms being unknown.

in all such forms might also suggest this. But such genera as *Distoloceras* and *Astiericeras* give evidence that many stocks of normal trachyostrachous ammonites produce "uncoiled" forms.

The details of septal sutures are of interest. In the normal large lytoceratids the suture is of the essential (I.U.L.E.) type; and without exception this type of suture is a feature of the heteromorphic forms. But this agreement in sutural plan among the latter has no genetic significance (even in tracing ancestry), for there can be no doubt that this type of suture is merely due to the mode of coiling. This is well seen in the genus *Distoloceras*, which has both "coiled" and "uncoiled" species; for in the former there are accessory lobes present, whereas in the latter the sutures are of the I.U.L.E. type. Zittel (**116**, vol. i., p. 332), Spath (**95**, p. 28), and others have drawn attention to the modification of septal suture due to the whorl shape. It may be pointed out that in the *Lytoceratidæ* the large forms (*Lytoceras* s. str., *Thysanoceras*, etc.) the septal sutures are of the I.U.L.E. type, while the smaller forms (*Gaudryceras*, *Alocolytoceras*, etc.) have accessory lobes. But unfortunately the complete development of a large lytoceratid has never been made, and even in the small *Gaudryceras* (?) *alamadense* developed by Perrin Smith[6] there is reduction of sutural elements.

The sutural simplification in, e.g., *Baculites* has been adduced as evidence of a benthonic habit. But many crioceratids, e.g. *Tropæum*, have quite complicated sutures; and this throws doubt upon the idea sometimes advanced that *all* crioceratids were benthonic. Certainly the increased fragility due to loose coiling would hinder rapid motion through the water; but this is compensated for by the increased thickness of shell which these forms attain.

But even though the number of lobes and saddles is reduced to the minimum, yet the details of the indentations of the septal sutures are still of service in tracing generic affinity, while the type of ornamentation is of fundamental importance.

DESCRIPTION OF SPECIES.

A. NEOCOMIAN SPECIES.

Family SIMBIRSKITIDÆ Spath.

Genus SIMBIRSKITES Pavlow (emend. Spath).

SIMBIRSKITES SPP. NOV.

1909 *Perisphinctes kayseri* (non Neumayr and Uhlig) Etheridge Jr. (**30**), p. 238, pl. 68.

The two associated specimens figured by Etheridge were regarded as the same species and identified by him with the *Perisphinctes kayseri* Neumayr and Uhlig (**65**, p. 146, pl. 19, fig. 1) of North Germany. But the German and Australian specimens differ considerably in proportions and cannot therefore be specifically identical.

[6] Proc. California Acad. Sci., Ser. 3, Geol., vol. i., 1898, pp. 138 *et seq.*

The zonal place of the large (*kayseri*) group has sometimes been misstated. Buckman (**11,** vol. iv., p. 16), e.g., by analogy with the Mexican *Proniceras*, has lately placed it even in the Lower Tithonian. But Spath (**103,** p. 87), in restricting *Simbirskites* to the *decheni* group with trifurcating ribs, has placed it in its true position in the Upper Hauterivian.[7] From Etheridge's figure (the specimens have not been seen by the writer) *S. kayseri* is the most similar form but has less rapidly increasing whorls. At the same time, however, it must be remembered that his specimen is considerably larger than the holotype of *S. kayseri*. The septal suture seems to be definitely simbirskitid. Most of the species of *Simbirskites* are known only from young specimens, which makes the comparison of this large form difficult. The large species figured by Neumayr and Uhlig (*S. hauchecornei*, *S. inverselobatus*, etc.) are less widely umbilicate, while *Perisphinctes losseni* Neumayr and Uhlig (**65,** p. 144, pl. 18) is probably a *Speetoniceras*.

The smaller specimen, which is probably a different species, is of the more normal[8] *Simbirskites* type.

Since the writer has not seen the specimens[9] it is not *definitely* established that the species do not belong perhaps to an earlier genus (e.g. the Kimmeridgian *Virgatites*), although their resemblance to *Simbirskites* is so strong. But they certainly represent the oldest marine mesozoic horizon yet known in Eastern Australia.

Simbirskites has been recorded (**50,** p. 114) though not figured from New Caledonia.

Locality.—Victoria Downs, Morven (Q.M. Coll.).

B. APTIAN SPECIES.

Family ACONECERATIDÆ Spath.

Two genera only, both represented in the "Rolling Downs," have hitherto been included in this family—*Aconeceras* Hyatt[10] and *Sanmartinoceras* Bonarelli. In erecting the genus *Aconeceras* Hyatt (**41,** p. 100) called attention to its phylloceratid characters, particularly the details of the septal suture, though he included it in the later family *Coilopoceratidæ*. But, from his manuscript notes,[11] he finally placed it "with the *Desmoceras* group" in *Phylloceratidæ*. Spath also has suggested that the family is derived from

[7] Large specimens of these *Simbirskites* have been found by the writer in bed C_4 at Speeton.

[8] Compare e.g. *S. payeri* (Toula) Pavlow (**72,** p. 148, pl. 11, fig. 1).

[9] Since the above description was written the writer has been able to examine the specimens and confirm their position within the genus *Simbirskites*. A further note on these forms will appear in a later paper.

[10] = *Adolphia* Stolley (**105**), p. 269.

[11] See footnote by J. P. Smith to Hyatt (**41,** pp. 100, 101).

Desmoceratidæ (**101,** p. 35). But the approximation of the earlier genus, *Aconeceras*, to *Phylloceras* in involution, ornament and septal suture gives evidence of a direct connection with *Phylloceratidæ*, and the view is here held that, like *Desmoceratidæ*, it is an independent branch from *Phylloceratidæ*.

The aconeceratid type of shell—i.e., an oxyconic form with falciform radial line and complicated septal suture of the phylloceratid type—is perhaps the most recurrent among the many oft-recurring types of trachyostrachous ammonites. The Lower Lias *Oxynoticeras* is an early type while the Mæstrictian *Pseudoschlœnbachia* (*umbulazi* group) is the last. On the theory of cyclical development such forms have been regarded as end points of series passing from an original capricorn type. But it is far more probable that these genera are heterochronous homœomorphs very close to *Phylloceratidæ*.[12] The Bajocian and Bathonian with *Lioceras*, *Strigoceras*, etc. is particularly rich in such forms. Comparison with *Strigoceras* is interesting, for similar concentric ornamentation typical of that genus is to be seen on *Aconeceras walshense* (Etheridge fil.).

The family ranges throughout the Aptian but is unknown in the Neocomian or Albian. Stolley (**106,** p. 217), it is true, has a zone of *Sanmartinoceras trautscholdi* which has sometimes been placed in the Lower Albian; but from the association of that species with *Parahoplites*, etc., it belongs to the uppermost Aptian. *Aconeceras* ranges through the Bedoulian and Lower Gargasian, and in the Upper Gargasian is replaced by *Sanmartinoceras*. But in the Bedoulian there is an offshoot from *Aconeceras*, **THEGANECERAS** gen. nov.,[13] which closely simulates *Sanmartinoceras*, and, as indicated below, probably accounts for certain records of the genus *Sanmartinoceras* in the Bedoulian.

Genus ACONECERAS Hyatt.

Specific distinctions within this genus are not easy to define. Stolley (**106,** pp. 211, 215) has recorded *A. nisus* (d'Orbigny) from the *sparsicosta* zone (the lowest zone of the Aptian) and *A. nisoides* (Sarasin) from the *bodei* zone of the Bedoulian. On the other hand Haug (**38,** p. 1170) places *A. nisus* as Lower Gargasian; and Kilian has recorded (**48,** p. 338) *A.*

[12] Interesting evidence on this point is given by the ornamentation. Most of the genera have the simple costulæ ("striæ") which are typically developed on *Phylloceras*; but on many lineages peripheral costation is suddenly developed similar to that of the phylloceratid *Tragophylloceras ibex* (Quenstedt). In that species, however, the course of the costæ and the costulæ does not correspond, and a costula may transgress two costæ as shewn by an example in the Sedgwick Museum Collection. This may be paralleled in the trachyostracous oxycones, and a similar transgression of the peripheral costæ is seen e.g. in "*Hebetoxyites*" *incongruens* Buckman (**11,** vol. v., pl. 497) from the Bajocian.

[13] θηγανη, a whetstone; genotype *Oppelia scalata* von Koenen (**51,** p. 54, pl. xlv., fig. 6). The genus is ribbed like *Sanmartinoceras* but the ribs are finer and more numerous. The septal suture is characterised by broad, short saddles. Other species are *T. falcatum* (v. Koenen), *T.* "*nisoides*" (pars) (v. Koenen non Sarasin).

nisoides as Bedoulian and *A. nisus* as Gargasian. In a later paper, however, Kilian[14] places *A. nisoides* also as Gargasian. Kilian and Haug therefore both agree in placing *A. nisoides* as Gargasian, only Stolley disagreeing in recording it in the Bedoulian. The specimens figured under this name from Zululand by Spath (**96,** pl. 26, fig. 4) and Delagoa Bay by Krenkel (**54,** pl. 17, fig. 1) are both recorded with Gargasian species.

Danford, however, figures a Speeton form as *A. nisoides* (**19,** pl. 14, fig. 7) which has been shown by Spath (**103,** p. 83) to belong to the *bidentatum* zone of the Bedoulian. The thickness of these figured specimens, given as a percentage of the whorl diameters, are—

A. nisoides (holotype) 21%; Speeton (Danford) 25%;
Zululand (Spath) 23%; *Basses Alpes* Specimens (B.M. Coll.) 21%;
Delagoa Bay (Krenkel) 22%.

Danford's specimen is thus thicker than the true *nisoides* and requires another specific name. It is probable, therefore, that Stolley's "*A. nisoides*" from the Bedoulian is this species rather than the true *nisoides*, which must be considered (? Lower) Gargasian. Von Koenen has recorded *A. nisoides* (**51,** p. 51) from the Bedoulian; but some of his specimens belong to *Theganeceras*, and it is doubtful if he has a form (even pl. 16, fig. 6) which is comparable with *nisoides*.

The horizon of such unfigured forms as that of Coquand (**14,** p. 46), e.g., is of course unknown.

ACONECERAS WALSHENSE (Etheridge fil.).

Pl. XXXIV., figs. 1 *a*, *b*; Pl. XXXVII., fig. 3.

1892 *Ammonites* (*Amaltheus*) *walshense* Etheridge Jr. (**42**), p. 493, pl. 42, figs. 10, 11.

Sp. Chars.—Coiling oligogyral, angustumbilicate, concavifastigate; sides slightly curved, convergent; anguliradiate, radial line with long peripheral projection; ornamentation by radial costulæ and a few mediolateral concentric costulæ; septal suture complicated, with many auxiliary lobes.

Dimensions.—

Holotype (Q.M. Coll.): ϕ 78. 58. 16. 13.

Topotype (Q.M. Coll.): 80 (68). 54. 18. 13.
49. 56. 19. 14.

Remarks.—This species is the largest known member of the genus and is particularly distinguished by the long peripheral curve of the radial line. It is most similar to *A. nisoides* (Sarasin) (**84,** p. 155, pls. 4-6, fig. 10), which it resembles closely in proportions, ornament, and septal suture. The numerous radial costulæ which characterise *A. nisoides* are present on *A. walshense*,

[14] Trav. Lab. Géol. Univ. Grenoble, vol. xii., 1919, p. 94.

and both species have the mediolateral concentric costulæ. Besides the difference in radial line *A. walshense* may be distinguished by its whorl section. *A. nisus* (d'Orbigny) (**69,** p. 184, pl. 55, figs. 7-9) and *A. aptiana* (Sarasin) (**84,** p. 155, pl. 4-6, fig. 12) also have different whorl sections, while the latter species, in its ornament, is transitional to *Sanmartinoceras*.

The species had been compared by Etheridge with forms belonging to several oxyconic genera, including *Amaltheus*, *Forbesiceras*, etc.

Locality.—Walsh River (Q.M. Coll.; holotype and others).

Genus SANMARTINOCERAS Bonarelli.

Sanmartinoceras includes the costate *Aconeceratidæ* of the Upper Gargasian. Stolley had recorded it from the Aptian of Ahaus (**106,** p. 217), where it is associated with *Parahoplites schmidti* and represents the uppermost Gargasian. Stolley (**106,** p. 215) has, however, recorded *S. haugi* (Sarasin) from the Bedoulian. This is certainly an error and perhaps the species meant was a *Theganeceras*.

In 1880 Prof. W. J. Stephens[15] recorded "*Ammonites biflexuoides*" from New South Wales. Such a specific name might refer to any member of the *Aconeceratidæ*. It is possible that Hudleston's later *Am. fontinale* may be indicated; but unless the specimen be found the name *biflexuoides* must be abandoned.

SANMARTINOCERAS FONTINALE (Hudleston).

1890 *Ammonites fontinalis* Hudlestone (**39**), p. 241, pl. 9, fig. 1.
1902 *Amaltheus sp. ind.* Etheridge Jr. (**25**), p. 45, pl. 7, fig. 8.
1924 *Sanmartinoceras fontinale* Spath (**103**), p. 74.

Sp. Chars.—Coiling oligogyral, angustumbilicate, compressed; concavifastigate; sides subparallel; anguliradiate with costation which diminishes towards the umbilicus.

Dimensions.—Holotype (B.M. Coll.): 25. 50. 26. 19.

Remarks.—Three other species of *Sanmartinoceras* have been described—the genotype *S. patagonicum* Bonarelli (**6**, p. 27, pl. 5, figs. 3-6), *S. trautscholdi* (Sinzow) (**90**, pl. 5, fig. 6) and *S. haugi* (Sarasin) (**84**, p. 156, pl. 4-6, figs. 11). Kilian (**48**, p. 337) has suggested that the last two are identical; but, although very similar, they must probably be regarded as distinct since, as figured by Sinzow, *S. trautscholdi* has the ribs continued to the umbilicus, whereas in *S. haugi* this is not so. Stolley (**106**, p. 217) records the former from Germany; but a specimen of *S.* aff. *trautscholdi* from near Lehrte (N.W. Germany) in the British Museum Collection has a wider umbilicus though, in that specimen, it widens with age.

[15] Proc. Linn. Soc. N.S. Wales, vol. viii., pt. 2, p. 281.

In having the ribs only on the ventro-lateral region *S. fontinale* is most similar to *S. haugi* and *S. patagonicum*. It is closer to the former in size and intensity of ribbing. A new species in the B.M. collection (c. 14366) from Germany has a very much wider umbilicus.

Localities.—Primrose Springs (B.M. Coll. holotype); Lake Eyre Basin (Tate Coll.).

SANMARTINOCERAS OLENE (Tenison-Woods).

Pl. XLI., fig. 3.

1883 *Ammonites olene* Tenison-Woods (**109**), p. 150, pl. 7, fig. 8; pl. 8, fig. 1.
1892 *Ammonites* (*Amaltheus*) *olene* Etheridge Jr. (**42**), p. 492, pl. 30, fig. 4.
1901 *Amaltheus olene* Etheridge Jr. (**24**), p. 32, pl. 2, fig. 4.

Sp. Char.—Coiling oligogyral, angustumbilicate, compressed; concavi-fastigate; sides subparallel; anguliradiate with costæ diminishing towards the umbilicus; costate portion begins very late; septal suture complicated, densi-septate.

Dimensions.—Q.M. Coll. $\begin{cases} 56. & 56. & 20. & 11 \\ 37. & 56. & 23. & 13. \end{cases}$

Remarks.—It is of interest that, since the related *Aconeceras walshense* is the largest member of its genus, the present species is the largest *Sanmartinoceras*.

The figure given by Etheridge in 1901 (**24**, pl. 2, fig. 4) of this species is somewhat incorrectly drawn.[16] The ribs were represented as rectiradiate whereas the course is typically falciform.

Etheridge believed that *S. olene* and *S. fontinale* represented but one species. There is certainly a considerable amount of variation in the forms that must be included in *S. olene*; but there seems to be a distinct specific difference between the forms from North Queensland (*S. olene*) and those of the Lake Eyre Basin (*S. fontinale*) in that, on the latter species, costation begins at an earlier stage than on *S. olene*.

S. patagonicum is apparently the most closely related species outside Australia, although *S. trautscholdi*, in which costation is not so prominent, is also close.

Localities.—Palmer River (M.M. Coll., holotype); Walsh River (G.S.Q. and Q.M. Colls.).

Family PARAHOPLITIDÆ Spath.

This important family, which includes such genera as *Parahoplites*, *Parahoplitoides*, *Stenhoplites*, *Dufrenoyia* and *Columbiceras*, is only doubtfully known in Australia from a single fragment. The family has a wide distribution; and, considering the large collections of Aptian Ammonites known from the Roma Series, the apparent rarity or absence of the group is remarkable.

[16] The specimen has been examined by the writer.

Genus PARAHOPLITOIDES Spath.

PARAHOPLITOIDES (?) SP.

1901 *Haploceras daintreei* Etheridge Jr. (non Etheridge Sen.) (**25**), p. 44, pl. 7, fig. 1.

This South Australian specimen was thought by Etheridge to be an aged example of *Puzosia daintreei*. But the type of ribbing (particularly the straightness of the costæ) is rather against this. The species may be a specialised form of *Parahoplitoides*, similar perhaps to *P. læviusculus* (von Koenen) (**51,** p. 224, pl. 8, figs. 4, 5). The type section of *Parahoplitoides* has rather flexed costæ as shown on *P. deshayesi* (Leymerie) (**56,** pl. 17, fig. 17); but species with more or less straight costæ are common.

Locality.—Dulkaninia Bore at a depth of 1,400 feet (Brown Collection).

Family CLEONICERATIDÆ nov.

The family is proposed for *Pseudosaynella* Spath, *Aioloceras* gen. nov. (v. inf.), *Cleoniceras* Parona et Bonarelli and *Sonneratia* Bayle. *Pseudosaynella*, which connects the family with *Aconeceratidæ*, might well be included in either family for it is closely related to *Aconeceras*. It is most probable that *Aioloceras*, which apparently gave rise to *Cleoniceras*, is directly derived from *Pseudosaynella*. The *balmense* group of *Cleoniceras* and the genus *Sonneratia* specialise in ornate forms; and it is not unlikely that even *Hoplitidæ* (via *Leymeriella*) may be in part derived from *Cleoniceratidæ*.

Genus **AIOLOCERAS** nov.[17]

Genotype *Cleoniceras argentinum* Bonarelli (**6**), p. 24, pl. 4, figs. 3, 6.

Diagnosis.—Platyconic shells with narrow venter; early whorls with sharp, falcate ribs, later whorls smooth; septal suture with narrow-stemmed bifid saddles, irregularly trifid L_1, and prominent suspensive lobe with a number of accessory lobes.

The genus includes *A. argentinum*, the "*Beudanticeras* cfr. *stoliczkai*" and "*Uhligella quercifolia*" of Bonarelli (**6,** pl. 3), and *Desmoceras jonesi* Gregory and Smith. It differs from *Cleoniceras* in the sharper ribs and absence of umbilical tubercle.

The Patagonian forms which were referred to the Albian genera *Beudanticeras* and *Cleoniceras* by Bonarelli occur in a bed below the horizon with *Sanmartinoceras patagonicum*, and, presumably, are Gargasian.

Although the genera *Aioloceras* and *Cleoniceras* are so similar there may be a slight hiatus between their ranges, for similar forms are not known from the *lowest* Albian. They may, therefore, possibly be homœomorphs in the same family.

[17] αἰόλος, changing (i.e. in ornament).

AIOLOCERAS JONESI (Gregory and Smith).

1903. *Desmoceras jonesi* Gregory and Smith (**36**), p. 142, pl. 22.

The writer has not seen the type of this species, whose whorl-section has not been figured. But the description of the feature given by Gregory and Smith shows that it agrees in general with that of *A. argentinum* as it does in the other features of involution and ribbing.

In the ornamentation ceasing at an early stage the genus is more like *Cleoniceras* of the *cleon* type (d'Orbigny, **69,** pl. 84, fig. 1) than like *C. seunesi* Bonarelli.[18]

The ribbing ceases at a slightly earlier stage than in most of the forms figured by Bonarelli, though it is most like *A. argentinum.* In the density of ribbing it is nearer to the typical form of that species rather than to *A. argentinum* var. *meseticum* (Bonarelli) (**6,** p. 24, pl. 4, fig. 7).

Unfortunately the ventro-lateral ornamentation of the early whorls of *A. jonesi* is not known, so that it is not certain whether the species possessed the rather *Cleoniceras*-like ribs which develop on *A.* "*stoliczkai*" (Bonarelli non Kossmat) (**6,** pl. 3, fig. 4).

The species had been compared to the *Ammonites beudanti* of Stoliczka (= *Beudanticeras stoliczkai*, Kossmat sp.). But, as Spath (**101,** p. 52) has stated, it has nothing to do with *Beudanticeras.*

Locality.—Mitchell River (Bourke Museum Coll.).

Family ANCYLOCERATIDÆ Hyatt (emend. nov.).

Hyatt (**40,** p. 587) included in this family the trituberculate heteromorphic genera of the Neocomian and Aptian, together with such widely different forms as the Lower Albian *Pictetia.* Even if restricted to the trituberculate genera the family is certainly heterogeneous. Most of the forms may be of more or less direct lytoceratid origin; but such genera as, e.g., *Distoloceras* have a more complex ancestry. *Ancyloceras* (s. str.) is found in the Lower and in the lower portion of the Upper Bedoulian, but its immediate ancestor is unknown. In the Upper (possibly at the top of the Lower) Bedoulian the new genus *Australiceras* (v. inf.) appears and is replaced in the Lower Gargasian by *Tropæum.* The inner whorls of *Australiceras* have trituberculation essentially of the *Ancyloceras* type; and it is most probable that this genus is derived directly from *Ancyloceras. Tropæum* is non-trituberculate; but the trituberculate *Australiceras* type is continued into the Lower Gargasian by the group of *A.* (?) *gigas* J. de C. Sowerby (**92,** vol. 6, p. 188, pl. 593, fig. 2). A specimen of *A.* (?) aff. *gigas* in the Sedgwick Museum collection shows that the early whorls were trituberculate similar to the

[18] See Seunes (**88**), pl. 12, fig. 1.

normal *Australiceras*. Further the tubercles are regained on the body-chamber; so that the only difference from the *jacki* group lies in the ancyloceratid type of coiling. However, as shown by specimens figured by Sinzow (**91**), *Tropæum* includes both crioceratid and ancyloceratid types so that there may be little genetic significance in this feature. But since only ancyloceratid types of trituberculate forms are known in the Lower Gargasian the group may be natural and require separation. Further the Upper Bedoulian group of "*Ancyloceras*" *urbani* Neumayr et Uhlig (**65**, pl. 50) may connect the *gigas* group directly with *Ancyloceras* thereby making it homœomorphous with *Australiceras*. But whether the group is derived from *Ancyloceras* or *Australiceras* must be determined by detailed zonal collecting.

Following immediately upon the disappearance of *Tropæum* the genus *Ammonitoceras*[19] makes its appearance. In every feature of size, ribbing, and coiling, even to the possession of similar coarse costæ on the body-chamber (see **17**, pl. 6), the two genera are identical. But the whorls of *Ammonitoceras* have bituberculation. From these two criteria of direct replacement in time and perfect agreement but for tuberculation, it is believed that *Ammonitoceras* is directly derived from *Tropæum*. This implies that tuberculation is suddenly developed throughout; and not first produced on the body-chamber, spreading to earlier whorls in later species. Such abrupt changes are known in other cases; and it may be remarked that, as suggested below, the transition from *Australiceras* to *Tropæum* appears to be effected by the sudden loss of tuberculation.

It is therefore suggested that, instead of including such extraneous genera as *Crioceras* (s. str.), *Acrioceras* and *Distoloceras*, the family *Ancyloceratidæ* should be restricted to the trituberculate *Ancyloceras* and *Australiceras*, the non-tuberculate *Tropæum* and the bituberculate *Ammonitoceras*. The relationship, if any, between the family and the micromorph genera *Toxoceratoides* and *Tonohamites* is yet to be decided.

Genus **AUSTRALICERAS** nov.

Genotype *Crioceras jacki* Etheridge Jr.

Diagnosis.—Crioceratid shells with initial whorls trituberculate, later whorls without tubercles until the adult body-chamber which is trituberculate; costæ simple or bifurcating near the umbilical margin; septal suture I.U.L.E. with prominently bifid, relatively short-stemmed saddles and regularly trifid lobes.

The genus is proposed for a group of species richly represented in the Australian[20] Aptian but known also in India by *Crioceras australe* Waagen

[19] See Dumas (**21**, p. 405, pl. 5). "*Ancyloceras*" *ackermanni* Krenkel, which was included in *Ammonitoceras* by Kilian, may however be an uncoiled *Cheloniceras* (**49**, p. 799).

[20] The genus is named from its typical development in this country.

non Moore (**111,** p. 246, pl. 60, fig. 1); in Russia by *Crioceras ramoseptatum* Anthula (**3,** p. 127, pl. 14, fig. 4), *Crioceras gracile* Sinzow (**91,** p. 327), etc.; and in England. In England it has been recorded[21] from the *bodei* zone of the Bedoulian; while in India, from its association with *Parahoplitoides* and *Cheloniceras*, *A. australe* (Waagen non Moore) represents an Upper Bedoulian horizon. The genus is apparently represented in the Aptian portion of the Hilsbildungen of North Germany; for one of Neumayr and Uhlig's figures (**65,** pl. 53, fig. 2) appears to represent an *Australiceras* with the mediolateral tubercle diminishing at the transition to the non-tuberculate stage. None of the Australian species has such small tubercles.

From its known occurrence in the *bodei* zone and from the fact that it gives rise to *Tropæum*, *Australiceras* has a range of the whole Upper Bedoulian. Whether it ranges down into the Lower Bedoulian is unknown. If the *gigas* group is also to be included the genus ranges into the Lower Gargasian. No member of that group, however, is yet known in Australia.

The genus had been compared by Boule (**9,** p. 181) to *Diadochoceras* (*nodosocostatum* group).

AUSTRALICERAS JACKI (Etheridge fil.).

(Pl. XXXIV., fig. 2.)

1880 *Crioceras jackii* Etheridge Jr. (**23**), p. 305, pl. 17, figs. 55-58.
1892 *Crioceras australe* (pars) (non Moore) Etheridge Jr. (**42**), pl. 32, figs. 1, 2.
1909 *Crioceras jackii* (pars) Etheridge Jr. (**30**), pl. 37, fig. 1; pl. 38, fig. 3.
1913 *Crioceras australe* Richards (**82**), p. 182.

Sp. Chars.—Coiling crioceratid; whorl-section slightly depressed, subtriangular; costæ rectiradiate, slightly flexed; initial whorls with fine tubercles on every rib, later whorls with prominent ribs with blunt or thorn-like prominent tubercles, and interspersed non-tuberculate ribs.

Dimensions.—

Holotype	77.	33.	43.	43.
(**30,** pl. 37, fig. 1)	90.	35.	—.	48.
(**30,** pl. 38, fig. 3)	65.	36.	—.	44.

Remarks.—The specific name was spelt *jackii* by Etheridge but is here emended to *jacki* to conform with the rules of nomenclature. Under this name Etheridge included many distinct forms, his interpretation of the "species" covering the genera *Australiceras* and *Tropæum* (pars). Specific distinctions are often difficult to define in heteromorphic genera; but several distinct groups are recognisable in the *Australiceras* of the "Rolling Downs."

[21] Spath (**103**), p. 79. Recorded as *Ancyloceras* cf. *gracile* (Sinzow). The species is represented by four specimens in the Sedgwick Museum Collection, which have been examined by the writer.

The four figured specimens included above in the synonymy of this species differ in the number of ribs per whorl, but have common features in type of ribbing and tuberculation. A large number of specimens is required to determine the limits of variation. The specimen now figured has unusually large tubercles but must be retained in the species.

Localities.—Walsh River (Q.M. Coll.; holotype and other specimens); Hughenden (Q.M. Coll.); Woody Island, Hervey Bay (U.Q. Coll.)

AUSTRALICERAS IRREGULARE (Tenison-Woods).

(Pl. XXXVII, figs. 1 *a*, *b*.)

1882 *Crioceras irregulare* Tenison-Woods (**109**), p. 151, pl. 8, fig. 2.

1892 *Crioceras irregulare* Etheridge Jr. (**42**), p. 501, pl. 33, fig. 1; pl. 49, fig. 16.

1905 *Crioceras jackii* (pars) Etheridge Jr. (**28**), p. 14.

1909 *Crioceras jackii* (pars) Etheridge Jr. (**30**), p. 145.

Sp. Chars.—Coiling crioceratid; whorl-section circular; costæ wide, rounded; tubercles sharply defined.

Remarks.—Tenison-Woods's species was united with *A. jacki* by Etheridge, but it differs from it in whorl-section (not having a flattened dorsum) and in greater width of umbilicus. The figure of the holotype had the initial stage restored to show a widely open first whorl. But Etheridge (**28,** p. 14), who re-examined the type and developed the inner whorls, states that this restoration is quite unjustifiable and that the initial whorls were of the same type in coiling as those of *A. jacki* proper. On the specimen now figured the whorl previous to the one preserved (as shown by an impression on the matrix of the dorsum) was very close to the later whorl.

Localities.—Palmer River (M.M. Coll., holotype); Walsh River (Q.M. Coll., G.S.Q. Coll.).

AUSTRALICERAS aff. IRREGULARE (Tenison-Woods).

1909 *Crioceras jackii* (pars) Etheridge Jr. (**30**), pl. 35, fig. 1.

The large specimen figured by Etheridge has not been seen by the writer; but its initial whorls appear to be very similar to those of *A. irregulare*. The species becomes more closely coiled in later whorls. At the transition to the non-tuberculate stage the inner row of tubercles are still retained for a short period after the outer and median rows have disappeared.

Locality.—Walsh River (Q.M. Coll.).

AUSTRALICERAS ROBUSTUM sp. nov.

1909 *Crioceras jackii* (pars) Etheridge Jr. (**30**), pl. 32, fig. 1; pl. 33, fig. 1.

Sp. Chars.—Coiling crioceratid; whorls robust with early whorls septi-tuberculate; costæ fairly straight, rectiradiate; whorl-section depressed; septal suture very similar to that of *A. jacki*.

Dimensions.—

Holotype: ϕ 144. 37. 42. 40.

B.M. Coll.: 123. 41. 54. 38.

Remarks.—This species differs from other members of the genus in being prominently septi-tuberculate.[22] The holotype, being an internal mould, only shows the truncate nature of the cast of the tubercles, but a British Museum specimen, with test preserved in places, shows the septate condition very well. Otherwise, in ribbing, whorl-section and thorn-like tubercles it is very similar to *A. jacki* but has the tuberculate stage persisting to a larger diameter. In both the holotype and the British Museum specimen tuberculation ceases at a diameter of 90 mm. The depressed whorl-section is another important feature distinguishing it from the other species. A young specimen in the Queensland Museum collection has earliest whorls of the *jacki* type but is septi-tuberculate at a diameter of 30 mm.

Both A. *robustum* and *A jacki* are in some respects similar to *A. ramoseptatum* (Anthula) (**3**, p. 127, pl. 14, fig. 4), but differ in ribbing and tuberculation.

Localities.—South Central Queensland (A.M. Coll., holotype); Flinders River (B.M. Coll.); Walsh River (Q.M. Coll.).

AUSTRALICERAS GRACILE (Sinzow).

(Pl. XXXIV., fig. 4.)

1908 *Crioceras gracile* Sinzow (**91**), p. 327, pl. 18, fig. 1.

1909 *Crioceras jackii* (pars) Etheridge Jr. (**30**), pl 36, fig 1; pl. 37, fig. 2.

Sp. Chars.—Coiling crioceratid; whorl-section circular; costæ straight, thin and reclined; septal suture unknown.

Dimensions.—

Figd. (**30**), pl. 36, fig. 1. ϕ 220. 32. —. 47.

Figd. (**30**), pl. 36, fig. 2. ϕ 105. 36. —. 46.

Remarks.—Under the name *Crioceras gracile* Sinzow figured a number of specimens which may belong to more than one species of *Australiceras*. No. specimen appears to have been selected as holotype; but if we are to take

[22] Judging from the figure, however, the last two tuberculate ribs of the holotype of *A. jacki* may also be septi-tuberculate. This condition recalls the earlier *Ancyloceras*.

his best specimen as such (**91**, pl. 18, fig. 1), the two specimens figured by Etheridge and quoted above must be regarded as belonging to the species. Etheridge's specimens differ from Sinzow's form in being more widely umbilicate and in having the tuberculate stage persisting to a greater diameter. But, considering the variation in crioceratid species, it is not advisable to erect a new specific name until more is known of the Australian forms.

The species has circular whorl-section and numerous, thin, strongly reclined ribs. The English form recorded by Spath (**103,** p. 79) as *Ancyloceras* cf. *gracile* (specimens of which have been seen by the writer) has more compressed whorls and thicker ribs, more like another of Sinzow's forms (**91,** pl. 17, figs. 1-4). *A. gracile* bears considerable resemblance to *A. irregulare* which has thicker ribs; while the ribs of *A. graciloides* (Sinzow) (**91**, p. 328, pl. 20, figs. 1, 2) are not so reclined.

Localities.—Victoria Downs, Warrego (Q.M. Coll.); Walsh River (Q.M. and G.S.Q. Colls.).

AUSTRALICERAS TRANSIENTE sp. nov.

(Pl. XXXIV., figs. 3 *a*, *b*.)

Sp. Chars.—Coiling crioceratid; whorl-section equidimensional, sides subparallel; costæ very faintly flexed, rectiradiate; tubercles faint, obtusely conical.

Dimensions.—Holotype: 84. 39. 40. 39.

Remarks.—On the holotype there are about 70 costæ to the last whorl. Tuberculation is not very marked, especially on the first half-whorl exposed. The species is perhaps most similar to *A. jacki* but is distinguished by more numerous costæ, sub-parallel sides, and faintness of tubercles. The tuberculate stage ceases on the holotype at a diameter of 50 mm. The septal suture is little known but has apparently broad-stemmed lobes and saddles.

Locality.—Walsh River (Q.M. Coll.).

AUSTRALICERAS LAMPROS (Etheridge fil.).

(Pl. XXXV., figs. 1 *a*, *b*.)

1909 *Crioceras lampros* Etheridge Jr. (**30**), p. 157, pl. 48.

Sp. Chars.—Coiling crioceratid; whorls massive; whorl-section subtriangular, almost equidimensional; rectiradiate; costæ thin, straight, close together on earlier whorls, coarse and widely separated on the body-chamber; initial and final stages trituberculate; septal sutures interlocking, with multidentate branches.

Dimensions.—

B.M. Coll. (figured): 340 (224). 35. 38. 41.
B.M. Coll. (25366): 325. 36. —. 44.

Remarks.—The specimen upon which Etheridge founded this species consisted of a body-chamber, with very coarse, trituberculate costæ, in the possession of the Geological Survey of Queensland. Recently, however, the earlier portion of the specimen has been found in this collection; and it is hoped that the complete holotype may be figured in a future paper. The earlier whorls are of the type shown by the fine specimen figured on Plate II.

The holotype has not the initial whorls preserved; but it is sufficiently complete to show that the early trituberculation ceased at a diameter of 55 mm. The initial whorls of the specimen now figured are also not preserved; but, at a diameter of about 45 mm. (i.e., the earliest stage preserved), there are faint suggestions of tubercles. There is thus a difference at which, in these two specimens, the initial tuberculation ceases; but there is every reason to believe that the specimens are co-specific.

A. lampros is very like certain forms of *Tropæum*, particularly the group of *T. bowerbanki* (J. de C. Sowerby) (**94,** p. 410, pl. 34, fig. 1), *T. hillsi* (J. de C. Sowerby) (**93,** p. 339, pl. 15, figs. 1, 2), and *T. cadoceriforme* (Sinzow) (**93,** pl. 21, fig. 3). The last-named species has a septal suture apparently identical with that of *A. lampros*. It is probable that this group of *Tropæum* is derived from the present species.

Localities.—Queensland! (G.S.Q. Coll., holotype); Glendower Station, Flinders River (B.M. Coll.).

Genus TROPÆUM J. de C. Sowerby.

The name *Tropæum* proposed in 1837 by J. de C. Sowerby (**94,** p. 409), but discredited in the same paper, was revived in 1900 by Hyatt (**40,** p. 571). The genotype is *Crioceratites bowerbanki* J. de C. Sowerby; and although the geno-holotype has not the initial whorls preserved, yet, as shown by a young specimen in the Sedgwick Museum Collection, the species is non-tuberculate. The genus is derived from *Australiceras*, with which it is identical in coiling, costation, and septal sutures, but it appears to have developed along several lines—*T. arcticum* being related to *A. transiente* and *T. rarum* to *A.* aff. *irregulare*. In all the species of *Australiceras* (with the exception perhaps of *A. robustum*) tuberculation ceases about the same diameter of whorl. In some forms all three tubercles disappear simultaneously (**30,** pl. 37, fig. 2), while in others the outer (**30,** pl. 38, fig. 3) or the inner (**30,** pl. 35, fig. 1) tubercle may be retained somewhat later than the other two. *A. transiente* agrees in every feature with *T. arcticum* except for tuberculation, and it is noteworthy that the tubercles on the former species are faint. Further, the tubercles on the earliest part visible of the holotype are fainter than on the last two tuberculate ribs, suggesting that the change from *Australiceras* to *Tropæum* was achieved by the abrupt cessation of tuberculation, and not that the tuberculate stage was driven further and further towards the origin in successively later species.

Tropæum is known in Europe in the two zones *bowerbanki* and *hillsi* of the Lower Gargasian.

TROPÆUM AUSTRALE (Moore).

1870 *Crioceras australe* Moore (**64**), p. 257, pl. 15, fig. 3.

1892 *Crioceras australe* Etheridge Jr., pl. 31, fig. 1.

Sp. Chars.—Coiling crioceratid, whorls massive. Whorl-section equidimensional. Costæ very numerous, thin and close together, rectiradiate to slightly reclined. Coarse costæ of the body-chamber regular and smooth.

Remarks.—By kind permission of the council of the Royal Literary and Philosophical Society of Bath (England), the writer was recently permitted to examine the collections of the Bath Museum in search for Moore's missing types of Australian Cretaceous fossils. The type of *Crioceras australe* has been lost and no record of it could be found.[23]

On the grounds of insufficient description and loss of type, Etheridge (**30,** p. 136) proposed that Moore's name should be abandoned. But the other figures of ammonites (Jurassic) given by Moore give a true representation of their species, and there is no reason to suppose that the same was not true of *Crioceras australe.* Further, there is one form in the Roma Series[24] which agrees in features with the species as figured by Moore. It is therefore not permissible to reject the specific name *australe* ; and the writer now chooses a specimen figured by Etheridge[25] in 1892 as the neotype of the species.

The neotype is a large specimen and one of the most complete crioceratids recorded from the series. The initial whorls are, unfortunately, not preserved ; but since the coarse costæ of the body-chamber are non-tuberculate the species is to be placed in *Tropæum* rather than in *Australiceras.*

T. australe is a member of the *bowerbanki* group (**94,** p. 410, pl. 34, fig. 1), but differs from Sowerby's species in its thinner ribs (which are more numerous) and in whorl-section (slightly). Some of the forms figured as *Crioceras bowerbanki* by Sinzow (**91**) are very similar.

Crioceras australe Waagen[26] non Moore (**111,** p. 246, pl. 60, fig. 1) is generically distinct from the species, being an *Australiceras.* Krenkel, quite unjustifiably, has identified the species as a *Cheloniceras* (*martini* group) (**54,** p. 162). Lemoine (**55,** p. 385) has correctly stated the form to be Aptian.

Localities.—Upper Maranoa River (holotype, specimen destroyed) ; Walsh River (neotype ; Q.M. Coll.).

[23] The writer has since learnt that these specimens perished in the Garden Palace Fire of London.

[24] From its locality (Upper Maranoa River) Moore's specimen must have been from the Roma Series.

[25] Etheridge (**42**), pl. 31, fig. 1. A plaster cast of the specimen in the B.M. Collection has been examined by the writer.

[26] The writer has seen Waagen's type which represents a species not known in Australia.

TROPÆUM LEPTUM (Etheridge fil.).

1909 *Crioceras leptus* Etheridge Jr. (**30**), p. 143, pl. 30.

Sp. Chars.—Coiling crioceratid; whorls compressed, with very numerous, narrow, rectiradiate costæ; whorl-section sub-triangular.

Dimensions.—Holotype, *θ.ϕ.* 73. 77.

Remarks.—This species differs from all other forms in the "Rolling Downs" in its compression. The inner whorls are unknown so that it may even be an *Australiceras*. It is very similar in lateral view to *T. bowerbanki* (Neumayr et Uhlig) non Sowerby (**65,** pl. 53, fig. 1), whose whorl-section is not known. *T. spp.* of Neumayr and Uhlig (**65,** pl. 54) are similar but not as compressed. *T. percostatum* Gabb (**35,** vol. i., pl. 16) has thicker ribs.

Locality.—Lind River (G.S.Q. Coll., holotype).

TROPÆUM ARCTICUM (Stolley).

1909 *Crioceras jackii* (pars) Etheridge Jr. (**30**), pl. 32, fig. 2; pl. 34, fig. 1.
1911 *Crioceras arcticum* Stolley (**107**), p. 16, pl. 1, fig. 1 (also text-figs. 1, 2).

Sp. Chars.—Coiling crioceratid; whorls with about 65 simple rounded costæ, slightly flexiradiate, separated by sulci of approximately the same width; aperture almost equidimensional.

Dimensions.—(**30**) Pl. 34, fig. 1: *ϕ* 118. 38. 38. 42.

The perfect agreement of the specimen figured by Etheridge with Stolley's holotype from the Gargasian of Spitzbergen is a matter of considerable interest; for the species otherwise has not been recorded beyond Spitzbergen. The dimensions, course of the ribbing, type and intensity of the costæ are precisely similar. Further there is the same number of ribs per whorl. The holotype is somewhat crushed so that Stolley was unable to give the shape of the whorl-section exactly; but it appears to have been approximately equidimensional as in Etheridge's specimen.

T. arcticum agrees perfectly with *Australiceras transiente* in every feature except tuberculation; and there is no doubt a close connection between the two species.

Locality.—Roma (Q.M. Coll.).

TROPÆUM UNDATUM sp. nov.

1909 *Crioceras jackii* (pars) Etheridge Jr. (**30**), pl. 31; pl. 38, figs. 4, 5.
1911 *Crioceras sp. nov.* (aff. *arcticum*) Stolley (**107**), p. 19, pl. 2, fig. 1.

Sp. Chars.—Coiling crioceratid; whorl with about 50 almost straight prorsiradiate ribs; aperture subcircular.

Dimensions.—

Holotype (Q.M. Coll.): *ϕ* 320. 32. 36. 44.
Paratype (G.S.Q. Coll.): *ϕ* 85. 33. 31. 44.

The larger of Etheridge's two specimens (pl. 31) is selected as holotype. The main features of the species are the regularly coiled, equidimensional whorls with prominent rounded costæ in the young stage (becoming thinner and wider apart with age), which continue with slight forward inclination across the sides. The septal suture is unknown. Stolley's Spitzbergen specimen appears to be identical with this species though the state of preservation is unsatisfactory.

The closest known form is undoubtedly *T. arcticum* Stolley, which differs in the greater number of costæ per whorl and their slight curvature *T. simbirskense*[27] Jasikowski is somewhat similar but more loosely coiled.

Localities.—

Holotype Q.M. Coll.): Queensland ! (G.S.Q. Coll.): Walsh River.

TROPÆUM RARUM sp. nov.

(Pl. XXXVI., figs. 1 *a*, *b*.)

Sp. Chars.—Coiling crioceratid; whorls massive, depressed, whorl-section almost semicircular; costæ wide, rectiradiate.

Dimensions.—

Holotype: 177 (164). 38. 43. 39.

B.M. Coll. (25358): 220. 40. 46. 39.

Remarks.—This species is very similar to the *Australiceras* aff. *irregulare*, from which it may be derived. It differs from other Australian species of *Tropæum* in its depressed whorl-section. *T. hillsi* (J. de C. Sowerby) (**93,** p. 339, pl. 15, figs. 1, 2), particularly the type figured by Keeping (p. 91, pl. 2), is probably the most similar European form, especially in whorl-section.

Localities.—Walsh River (Q.M. Coll., holotype); Flinders River (B.M. Coll.).

Genus TOXOCERATOIDES Spath.

TOXOCERATOIDES TAYLORI (Etheridge fil.)

1892 *Ancyloceras taylori* Etheridge Jr. (**42**), p. 498, pl. 42, fig. 13.

non 1909 *Crioceras taylori* Etheridge Jr. (**30**).

Sp. Chars.—Micromorph, coiling ancyloceratid; non-tuberculate; costæ broad; cross-section sub-circular, slightly compressed.

Remarks.—Two specimens of this species are known—the holotype from the Walsh River and a fragmentary specimen, associated with *Australiceras robustum*, from the same locality. Both specimens are in the collection of the Queensland Museum.

[27] See Sinzow (**90**), pl. 6, fig. 1. The species was wrongly identified as *Australiceras gracile* by Kilian (**48,** p. 355).

Toxoceratoides includes both tuberculate and non-tuberculate species, the latter no doubt derived from the former. Forms like *T. royerianus* (d'Orbigny) (**69,** p. 481, pl. 118, figs. 7-11) have trituberculation; in others, e.g. *T. royeri* (v. Koenen pars, non d'Orbigny) (**51,** p. 399, pl. 37, fig. 7), the row of umbilical tubercles has disappeared. *T. taylori*, in being non-tuberculate, agrees with *T. rotundus* (Phillips);[28] but a closer relationship exists with *T. æquicingulatus* (von Koenen) (**51,** p. 394, pl. 37, figs. 5, 6). Von Koenen's species has faint ventro-lateral tubercles, which are not present on *T. taylori*, otherwise the agreement is very close.

As mentioned below, there is unfortunately a very close resemblance between *T. taylori* and *Labeceras bryani* which occurs at another horizon in the "Rolling Downs."

Locality.—Walsh River (Q.M. Coll.).

C.—ALBIAN SPECIES.

Family DESMOCERATIDÆ Zittel.

This family has been critically revised by Dr. Spath in recent papers (**98** and **101**).

In tracing the generic succession in the *Desmoceratidæ* the apparent continuity of a puzosid stock is particularly noticeable. The Upper Barremian to Lower Aptian *Melchiorites* is replaced in the Aptian (? Lower Gargasian) by *Uhligella* (s. str.). *Puzosia* itself appears in the Lower Albian—e.g. *P. kiliani* Fallot, *P. quenstedti* (Parona and Bonarelli), etc.—and continues into the Cenomanian where *Austiniceras* makes its appearance. All three genera have a strong community of character (in ornament, coiling, constrictions, and septal suture); and, since they replace one another in time, most probably form a lineage.[29] Inflated forms (*Pleuropachydiscus*, *Callizoniceras*, *Desmoceras*, etc.) have been produced from time to time, and *Desmoceras*, e.g., may be connected with *Puzosia* via the group of *P.* cf. *emerici* (Parona and Bonarelli) non Raspail sp. (**71,** p. 80, pl. 11, figs. 1, 2). Such inflated forms, though often of long duration, were apparently not very important as nuclei from which other genera developed. Such specialised genera as, e.g., *Hauericeras* and *Pachydiscus* are also probable offshoots from the puzosid lineage.

[28] Phillips (**75**), pl. 1, fig. 24. The species, specimens of which have been collected by the writer at Speeton, has not been adequately figured.

[29] Dr. Spath, however, doubts whether there is a connection between *Puzosia* and *Uhligella* (**101,** p. 34); but the writer believes that the type *Uhligella* is very close to *Puzosia*. The occurrence of the *Uhligella* type of ornament on a rare form of *Puzosia communis* as mentioned by Spath (**101,** p. 49) is of interest in this connection. The other possible explanation of the family *Desmoceratidæ* would be that it is an assemblage of homœomorphous genera repeatedly derived from *Phylloceratidæ*, etc.; and, while the writer believes that some forms have been thus derived, a central puzosid lineage from which other genera developed is regarded as the most satisfactory explanation of the majority of the desmoceratids.

Spath (**98,** p. 128) has suggested that the genus *Parapuzosia* is not directly developed from *Austiniceras* and points to "*Puzosia*" *curvatisulcata* Chatwin and Withers as a more nearly related form. But it is admitted later that this species may also be an *Austiniceras*; and the writer believes that *Parapuzosia* is probably the end form of the lineage.

The relationships of *Beudanticeras* Hitzel are not clear. Within the genus there are two groups represented by forms with narrow and wide stems respectively to the septal saddles. This was realised by Jacob (**45),** who placed them in different but ineligible genera. Whether, therefore, the genus had a dual origin is a matter for investigation. Spath (**101,** p. 37) believes *Beudanticeras* to be a special "wave" of phylloceratids; but the writer believes that, at least in part, the group is derived from *Uhligella*. The ornamentation of such forms as *B. dupinianum* d'Orbigny is very like that of *Uhligella* on the one hand and *Cleoniceras* on the other.

It is most probable that *Desmoceratidæ* were derived from *Phylloceratidæ,* particularly owing to the nature of the septal suture. But the close approximation of such forms as *Desmoceras* and certain *Parapachydiscus*—e.g. *P. umtafunensis* (Crick ms.) Spath (**98,** p. 133, pl. 9, fig. 4—to *Lytoceratidæ* (*Gaudryceras* and *Tetragonites*) makes distinctions very difficult, particularly since little is known of developmental details of the species in the various genera. Spath has suggested (**101,** p. 33) that *Desmoceratidæ* as known at present may even contain some derivatives of *Lytoceratidæ*.

Genus PUZOSIA Bayle.

PUZOSIA LONGMANI sp. nov.[30]

(Pl. XXXVII., fig. 5; Pl. XXXIX., figs. 1 *a, b.*)

Sp. Chars.—Coiling serpental, subangustumbilicate; sides slightly convergent (sub-parallel), venter evenly arched; gradumbilicate; seven or eight faint constrictions per whorl, each slightly flexed and with a very small (almost negligible) peripheral projection; densiseptate; septal suture with irregularly bifid saddles and slightly irregularly trifid lobes.

Dimensions.—Holotype (Q.M. Coll.): 105 (94). 47. 34. 24.

Remarks.—Only the one specimen (of unusually large size) is known at present. The most similar species is *P. communis* Spath (**101,** p. 47, pl. 2, fig. 3), which has the same dimensions and agrees almost perfectly in whorl-section and type of septal suture. *P. longmani*, however, is gradumbilicate whereas the umbilical shoulder in *P. communis* is rounded; further, the constrictions are less prominent and the saddles of the septal sutures have narrower stems. *P. sharpei* Spath (**101,** p. 46, pl. 1, figs. 11, 12) has a wider umbilicus and fewer constrictions. *P. mayoriana* (d'Orbigny) (**69,** p. 267,

[30] In honour of Mr. H. A. Longman, Director of the Queensland Museum.

pl. 79) has a similar (though wider) gradumbilicus but fewer constrictions and there is a deeper suspensive lobe to the septal suture. Further the constrictions have a very pronounced peripheral projection. *P. mayoriana* var. *natalensis* Crick (**16,** p. 213, pl. 14, fig. 4) is closer in the faintness of constrictions; but whorl-section and the peripheral projection of the constrictions are still different. The huge *P.* (?) *subtilis* Crick (**16**, p. 217, pl. 14, fig. 5) has strongly prorsiradiate constrictions but agrees fairly well otherwise. The constrictions of *P. furnitana* (Pervinquière) (**73,** p. 157, pl. 6, figs. 27, 28), *P. crebrisulcata* Kossmat, and *P. odiense* Kossmat (**52. c,** pl. 17, fig. 4; pl. 16, fig. 5) have different curvature. The Lower Cenomanian *P. planulata* (J. de C. Sowerby) (**92,** vol. vi., p. 134, pl. 570, fig. 5) and *P. octosulcata* (Sharpe) (89, p. 42, pl. xix., fig. 3) differ in dimensions.

In the Lower Albian there are several groups of *Puzosia*; and the group of *P. quenstedti* (Parona and Bonarelli)[31] (**71,** p. 81, pl. 11, fig. 3) and *P. kiliani* Fallot (**32,** p. 513, pl. 1, figs. 1-3) bears considerable resemblance to the present species. The writer believes that *P. quenstedti* is ancestral to both *P. mayoriana* and *P. communis*.

Locality.—Barcoo River (Q.M. Coll.).

Genus BEUDANTICERAS Hitzel.

BEUDANTICERAS FLINDERSI (McCoy).

1865 *Ammonites flindersi* McCoy (**58**), p. 51.
1865 *Ammonites flindersi* McCoy (**59**), p. 334.
1867 *Ammonites flindersi* McCoy (**60**), p. 196.
1868 *Ammonites flindersi* McCoy (**61**), p. 42.
1878 *Ammonites beudanti* var. *mitchelli* Etheridge (Senior) (**22**), p. 345, pl. 23, fig. 1 only.
1892 *Haploceras flindersi* Etheridge Jr. (**42**), p. 494, pl. 30, figs. 1, 2 only.
1902 *Haploceras flindersi* Etheridge Jr. (**26**), p. 31.

Sp. Chars.—Coiling oligogyral, subangustumbilicate; sides flattened, venter evenly arched, whorl-section subovate; gradumbilicate; fine subfalciform striæ radially directed, sometimes also faint sub-costæ; constrictions rare and faint; septal suture with irregularly trifid external lobe, narrow-stemmed saddles and prominent suspensive lobe.

Dimensions.—

Figured Etheridge (**22**), pl. 23, fig. 1 :	ϕ	130. 44. 28. 29.
Q.M. Coll.	ϕ	187. 46. 28. 29.
	ϕ	142. 43. 27. 28.

Remarks.—Etheridge jr. (**42,** p. 495), who examined McCoy's type, believed this species to be identical with *Ammonites beudanti* var. *mitchelli*

[31] *P. mayoriana* Bayle non d'Orbigny sp. (**69,** vol. iv., pl. 45, figs. 6-8) is probably this species as Spath has indicated (**101**, p. 45).

Etheridge (Senior). This identification is confirmed by the present writer, who hopes to figure McCoy's types of Australian Cretaceous invertebrates in a forthcoming paper.

Spath (**101,** p. 52) believed that the species, as represented by Etheridge's original figure, is not a *Beudanticeras*. With this view the writer disagrees. Within the genus there are two groups—one, typified by *B. beudanti* (Brongniart),[32] having narrow-stemmed saddles; the other, typified by *B. lævigatum* (J. de C. Sowerby),[33] with wide stems. Both groups appear in the Lower and continue to the Upper Albian. *B. flindersi* belongs to the first (type) group. The genus is really of little use for the zonal correlation of distant areas (unless identical species occur) owing to its long duration and rather conservative characters.

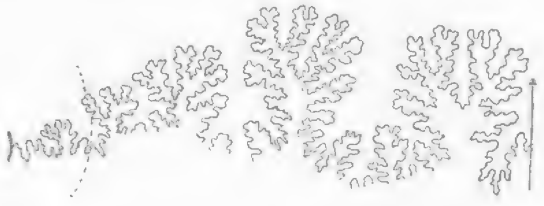

Fig. 1.—Septal suture of *Beudanticeras flindersi* (McCoy). Specimen from Hughenden (Q.M. Coll.). Nat. size.

The septal suture of *B. flindersi*, with its prominent suspensive lobe, agrees fairly well with that of *B. beudanti* and *B. sphærotum* (Seeley);[34] but the Lower Albian *B. convergens* (Jacob) (**44,** p. 29, pl. 2, figs. 24-26) also possesses this feature, although it is apparently absent from *B. walleranti* (Jacob) (**44,** p. 31, pl. 3, figs. 1-4). The ornament never becomes as prominent as in *B. rebouli* (Jacob) (**44,** p. 32, pl. 4, figs. 1-5), although a Queensland Museum specimen has faint costæ on the body-chamber similar to that on a specimen of *B. walleranti* figured by Jacob (**44,** pl. 3. fig. 2). The venter is not narrowed as in *B. beudanti*, but is more like that of *B. sphærotum*, which is perhaps the nearest European species. The Indian *B. stoliczkai* Kossmat (**52**, p. 119, pl. 18, fig. 6) is probably the most similar species, but the suspensive lobe is more prominent. Further, although several young specimens of *B. flindersi* have been examined by the writer, none have shown the prominent constrictions which are developed in the young stages of *B. stoliczkai*.

Localities.—Base of Walker's Tableland, Flinders River (N.M. Coll., holotype); Hughenden Station, Flinders River (R.D. Coll.); Hughenden (Q.M. Coll.).

[32] Brongniart (**18**), pp. 95, 99, 394, pl. 7, fig. 2. See also Spath (**101**), p. 49.

[33] J. de C. Sowerby (**92**), vol. vi., p. 93, pl. 549, fig. 1. See also Spath (**101**), p. 55.

[34] Type figured by Spath (**101**), p. 53, pl. 3, fig. 1.

BEUDANTICERAS (?) DAINTREEI (Etheridge).

1872 *Ammonites daintreei* Etheridge (**22**), p. 346, pl. 24.
1892 *Haploceras daintreei* Etheridge Jr. (**42**), p. 495, pl. 29, figs. 1-3.
1901 *Haploceras daintreei* Etheridge Jr. (**24**), p. 30, pl. 1, fig. 3.
1902 *Haploceras daintreei* Etheridge Jr. (**26**), p. 49, pl. 7, figs. 2-4.
? *non* 1902 *Haploceras daintreei* Etheridge Jr. (**25**), p. 44, pl. 7, fig. 1.
non 1913 *Haploceras daintreei* Etheridge Jr. (**31**), p. 23.
non 1921 *Beudanticeras daintreei* Bonarelli (**6**), p. 23, pl. 3, fig. 5.

Sp. Chars.—Coiling oligogyral, sublatumbilicate, subgradumbilicate; sides convergent, venter arched, whorl-section ovate; subcostate, with intermittent constrictions; septal suture complex, with many auxiliary lobes and prominent suspensive lobe.

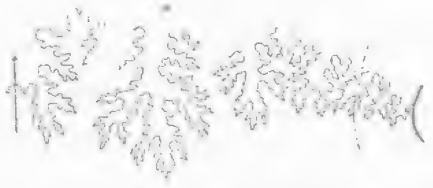

Fig. 2.—Septal suture of *Beudanticeras* (?) *daintreei* (Etheridge). Specimen from Hughenden (Q.M. Coll.). Nat. size.

Dimensions.—

Holotype (R.D. Coll.) : ϕ 98. 43. 30. 35.
Figured (**26**), pl. vii. : ϕ 135. 42. 32. 34.
Q.M. Coll. : 124. 45. 31. 31.
96. 44. 34. 33.

Remarks.—This species is rather difficult to place generically. In many respects it resembles the Upper Aptian *Uhligella*, particularly the group of *U. sequenzæ* (Coquand) (**15,** p. 40, pl. 11, fig. 10) and *U. stremmei* (Zwierzycki) (**116,** p. 69, pl. vii., figs. 3, 4). It has relationships with both *Puzosia* and *Beudanticeras* and may indeed be a separate offshoot from the former, parallel to *Beudanticeras*. The ornament is distinctly puzosid although certain groups of *Beudanticeras* (e.g. *B. rebouli* Jacob sp.) are prominently costate. The inflation of the shell is also reminiscent of *Puzosia*.

The South Australian specimen figured by Etheridge (**25,** p. 44, pl. 7, fig. 1) may be a *Parahoplitoides* as mentioned above. Etheridge (**31,** p. 23) also recorded the species doubtfully from the Gin Gin chalk (Lower Santonian) of Western Australia. These specimens, however, seen by the writer, belong to *Parapuzosia*. The Aptian "*Beudanticeras daintreei*" figured by Bonarelli from Patagonia is not this species and probably belongs to *Uhligella* or *Aioloceras*.

Localities.—Hughenden (R.D. Coll., holotype); Hughenden (Q.M. Coll.); Yandamah Creek (M.G.M. Coll.).

BEUDANTICERAS (?) SUTHERLANDI (Etheridge).

1872 *Ammonites sutherlandi* Etheridge (**23**), p. 345, pl. 21, fig. 4.

1892 *Ammonites* (*Haploceras*) *sutherlandi* Etheridge Jr. (**42**), p. 496, pl. 29, fig. 4.

The writer has not seen an example of this species. It appears to be an abnormally involute *Beudanticeras*, and in the absence of further evidence is tentatively placed in that genus. Etheridge (**42**, p. 496) compared it with *Ammonites cassida* Raspail which is a Hauterivian *Barremites* and quite distinct.

Locality.—Marathon (R.D. Coll., holotype).

Family DIPOLOCERATIDÆ Spath.

Genus PROHYSTEROCERAS Spath.

PROHYSTEROCERAS RICHARDSI sp. nov.[35]

(Pl. XXXVI., fig. 2; pl. XXXVIII., figs. 1 *a*, *b*.)

1909 *Schloenbachia rostratus* (J. Sowerby) Etheridge Jr. (pars) (**30**), pl. 67, fig. 1 only.

Sp. Chars.—Coiling serpental, sublatumbilicate; alticarinate; sides almost flat, venter planicarinate, whorl-section approximately square; costæ broad, rounded, and very slightly flexed, bifurcating at the umbilical edge where, in the young stage, there is a prominent tubercle (bullate) which diminishes with age; ventro-lateral tubercle barely developed, but with faint spiral grooving; septal suture with bifid saddles and regularly trifid lobes, L_1 much shallower than EL.

Dimensions.—

Holotype (Q.M. Coll.):	145. 42. 30. 41. 100. 44. 33. 43.
Figured (**30**), pl. 67, fig. 1:	ϕ 106. 33. —. 43.
(F.W.W. Coll.):	84. 32. 33. 46.

Remarks.—The species belongs to the group of quadrate-whorled forms with planicarinate venter characteristic of the *varicosus* and upper *orbignyi* zones. *P. richardsi*[36] actually appears to be present at Folkestone. *P. goodhalli* (J. Sowerby) (**92**, vol. ii., p. 100, pl. 255) is very similar but more compressed; and the Madagascan species, erroneously identified by Boule, Lemoine and Thevenin[37] as *Schloenbachia* (*Mortoniceras*) *bourchardiana* (d'Orbigny) appears to differ only in having slightly more ribs per whorl. *P. burckhardti* (Böse) (**7**, p. 61, pl. 1, figs. 1, 2, 4, 5) is rather similar but more compressed and the costæ are more flexed. *P. balmatianum* Pictet (**79**, p. 97, pl. 9, fig. 1) has

[35] In honour of Professor H. C. Richards.

[36] Represented by a specimen in the Sedgwick Museum Collection.

[37] Boule, Lemoine and Thevenin (**10**), p. 39, pl. 9, fig. 11. D'Orbigny's species is a *Dipoloceras*.

a similar whorl-section but there are considerable differences in ornamentation, particularly in the development of the ventro-lateral tubercle. The Indian *P. propinquum* (Stoliczka) (**104,** p. 53, pl. 31, figs. 1-2) is similar but differs in whorl-section and in the peculiar decline of ornament on the body-chamber. *P. decipiens* Spath (**97,** p. 145, pl. 4, fig. 13) has certain points of resemblance but the ribs are straighter and rarely bifurcate.

The septal suture of *P. richardsi* is peculiar in the shallowness of L_1, a condition reminiscent of the *Dipoloceras* and *Inflaticeras* type of suture.

Localities.—"Toliness," Augathella (Q.M. Coll., holotype); South Central Queensland (A.M. Coll.); 23 miles S.W. of Tambo (west bank of Ward River) (F.W.W. Coll.).

PROHYSTEROCERAS RICHARDSI var. NITIDUM nov.

(Pl. XXXVI., fig. 3.)

1909 *Schloenbachia rostratus* var. *antipodeus* Etheridge Jr. (non olim) (**30**), p. 237, pl. 67, figs. 3, 4.

The small form figured by Etheridge differs from *P. richardsi* proper mainly in having sharper ribs, and may be separated as a variety of that species, Etheridge's specimen being taken as the type. It has nothing to do with Etheridge's *Hystrichoceras* (?) *antipodeus* from Point Charles which belongs to another genus. The measurements given here are taken from a plaster cast of the holotype kindly supplied by the Australian Museum.

Dimensions.—Holotype: 44. 30. 35. 47.

Locality.—South Central Queensland (A.M. Coll., holotype).

PROHYSTEROCERAS ANGOLAENSE (Boule, Lemoine et Thevenin).

1892 *Ammonites* (*Schloenbachia*) *inflatus* Etheridge Jr. (non Sowerby) (**42**), p. 493, pl. 34, figs. 1-3.

1907 *Schloenbachia inflata* var. *angolaensis* Boule, Lemoine and Thevenin (**10**), p. 41, text-fig. 21.

1909 *Schloenbachia rostratus* Etheridge Jr. (non Sowerby) pars. (**30**), pl. 65; pl. 66, fig. 1 only.

P. angolaense is undoubtedly very closely related to *P. richardsi*, differing in the wider spacing of the ribs and probably in the peculiar ventro-lateral tubercle which develops on later whorls. The writer has not found it possible to separate specifically the Queensland and Madagascan forms; and this is of interest in view of the presence of other species in Madagascar closely allied to P. *richardsi*.

Boule, Lemoine and Thevenin's treatment of *Inflaticeras æquatoriale* (Kossmat) included several species of both *Inflaticeras* and *Prohysteroceras*. One of the latter (**10,** pl. 9, figs. 8, 9) is probably related to *P. richardsi* and, in its ventro-lateral tubercle, develops parallel to *P. angolaense*.

The group of species which develops this peculiar tuberculation on advanced whorls is characteristic of the Upper *orbignyi* and the *varicosus* zones in the Folkestone section. In the later costæ not bifurcating the group apparently is somewhat parallel to *Elobiceras*. Spath (**97**, p. 101) included Etheridge's specimen[38] in *Inflaticeras* (= *Subschloenbachia*); but although the group is transitional to *Inflaticeras* it is more advisable to leave the species in *Prohysteroceras*.

Locality.—South Central Queensland (A.M. Coll.); Glanmire Block, near Tambo (G.S.Q. Coll.).

Genus INFLATICERAS Stieler.

INFLATICERAS SP. NOV.

1909 *Schloenbachia rostratus* Etheridge Jr. (non Sowerby), pars, (**30**), pl. 66, fig. 2; pl. 67, fig. 2 only.

This species is only known from fragments at present. It belongs to a group of forms characteristic of the *varicosus* zone and of which *Schloenbachia rostrata* Bayle non Sowerby sp. (**5**, pl. 91) may be taken as the type. This group differs from later species of *Inflaticeras* (*rostrata* group, etc.) in the concentric ornament being developed on the sides also, and not confined to the ventro-lateral tubercle. It probably leads directly to the group of *I. perinflata* Spath[39] in which, besides having the concentric ornament only on the outer tubercle, there are differences in the duplication of the ventro-lateral and prominence of the medio-lateral tubercle.

This group, unfortunately, is inadequately figured and the whorl-section of Bayle's specimen is unknown.

A specimen in the Australian Museum Collection shows that, at least at a whorl thickness of 30 mm., the ventro-lateral tubercle had not developed; so that the group has very early features of *Inflaticeras*. On a badly worn specimen in the writer's collection bifurcation of costæ ceases at a diameter of about 145 mm.

Localities.—South Central Queensland (A.M. Coll.); 23 miles S.W. of Tambo, west bank of Ward River (F.W.W. Coll.).

Family HAMITIDÆ Hyatt (emend. Spath).

Three names are in common use for the costate non-tuberculate hamitids of the Albian—*Hamites* Parkinson, *Torneutoceras* Hyatt and *Helicoceras* d'Orbigny; but the significance of each name is not definite. *Hamites* includes

[38] Etheridge (**30**), pl. 65.

[39] Spath (**97**), p. 113; holotype, Pictet and Campiche (**78**), pl. 22, fig. 3.

the groups of *attenuatus* J. Sowerby (small "Lower" Gault forms) and *maximus* J. Sowerby (large forms of the "Upper" Gault), though little is known of species from the *delaruei* and lower *cornutus* zones.

The Upper Albian forms have delicate attenuated shells with either spiral or "ptychoceratoid" initial whorls. For the group of *Hamites attenuatus* d'Orbigny non Sowerby (**69,** p. 533, pl. 131, figs. 9-13), Hyatt (**40,** p. 586) proposed the genus *Torneutoceras*, no definition being given. D'Orbigny's figure is apparently somewhat idealised; but the species differs from the *maximus* group in the costæ being less inclined and not continued across the dorsum, and (possibly) in the "ptychoceratoid" beginning. Unless a division into two such groups has a zonal significance there is little occasion for separating "*Torneutoceras*"; for the costal distinction is not particularly momentous and, with the known variation in initial whorls of these forms, the "ptychoceratoid" character is of doubtful importance. When more complete individuals of *H. venetzianus* Pictet (**79,** p. 134, pl. 14, fig. 6) are known this may have to be separated as a new genus, but it is advisable to retain *H. attenuatus* d'Orbigny non Sowerby in *Hamites*.

There is a constant tendency in the normally coiled ammonites towards asymmetry, sometimes shown in the disagreement between two halves of a septal suture, in the siphuncle deviating from the median line, in the alternation of ventro-lateral tubercles or in a tendency for the coiling to vary from a plane. In *Hamites* with its delicate initial whorls so far apart such a tendency must lead to helicoid forms; and a species may include forms some with uniplanous and some with helicoid initial whorls. But *Helicoceras* d'Orbigny (**69,** p. 611; see Spath **97,** p. 149) has been proposed for the helicoid hamitids differing from *Hamites* only in coiling. Such a genus must have little systematic value and very probably may have to be abandoned. The genus *Turrilitoides* Spath (**99,** p. 76), however, which is also a non-tuberculate hamitid, covers a natural group.

Smooth developments of the *Hamitidæ* appear in the Upper Albian. *Lechites* Nowak (**66. a,** p. 350), which is closely related to *Hamites*, is derived by the decreasing costation and increased length of the shell. *Cyrtochilus* Meek (**63,** p. 392), which develops from *Lechites*, continues the decline of costation, most of the septate portion being smooth. It is most characteristic of the Lower Cenomanian though the Upper Albian *C. bourchardianus* (d'Orbigny) is an early member of the genus. Nowak (**66a,** p. 350), apparently overlooking Meek's generic name but recognising the relationship between the two genera, included *C. baculoides* (Mantell) in *Lechites*; but he gives erroneous data for the age of the species, and *Lechites gaudini*, which is narrowly restricted in the Upper Albian, is stated to range through the entire Cenomanian.

Genus HAMITES Parkinson.

HAMITES aff. MAXIMUS J. Sowerby.

(Pl. XXXIX., figs. 2 *a*, *b*.)

One specimen is known, represented by a body-chamber, with an injury on one side (not shown in the figure). The cross-section is circular. Costæ are discontinuous across the dorsum. The thin flange-like costæ remove it from *H. maximus* J. Sowerby (**92,** vol. i., pl. 62, fig. 1) and *H. attenuatus* d'Orbigny non Sowerby (**69,** pl. 131, fig. 9), though this difference may be due to the specimen being an internal mould. Similar flange-like costæ occur on the *H. rotundus* (non Sowerby) of d'Orbigny (**69,** pl. 132, fig. 1) and Pictet (**79,** p. 129, pl. 14, fig. 1), and on the American *H. æquicostatus* Gabb (**35**, vol. i., p. 74, pl. 13, fig. 20). It is larger than *H. intermedius* J. Sowerby (**92,** vol. i., pl. 62, fig. 2) and the costæ are wider apart than in *H. charpentieri* Pictet (**79,** p. 131, pl. 14, figs. 2-4). The group is particularly characteristic of the *cristatus* zone at Folkestone.

The septal suture has short prominently bifid wide-stemmed saddles and regularly trifid lateral lobes.

Locality.—Ward River (head of Warrego) (Q.M. Coll.).

HAMITES SP. NOV.

1909 *Crioceras sp.* Etheridge Jr. (**30**), pl. 42, fig. 1.

The specimen figured by Etheridge is a member of the *maximus* group of *Hamites* but distinct from all species described. Its huge size renders comparison difficult though some undescribed Folkestone forms approach it closely.

Locality.—Tambo (A.M. Coll.).

Genus **LABECERAS** nov.

Genotype : *Labeceras papulatum* sp. nov.

Diagnosis.—Small shells with ancyloceratid coiling ; aperture with short lateral lappets but no rostrum, costæ simple ; septal suture I.U.L.E., with broad saddles and relatively narrow lobes.

It is doubtful whether this genus is related to *Hamitidæ* or *Scaphitidæ* ; and for the present it is left with the former family. The early whorls are crioceratid, but the body-chamber is developed on a hook-shaped termination. Five species are known : *L. laqueus* (Etheridge fil.), *L. bryani* sp. nov., *L. compressum* sp. nov., *L. papulatum* sp. nov., and *L.* (?) *trifidum* sp. nov. The first three show no signs of tuberculation, but on *L. papulatum* and *L* (?) *trifidum* tubercles are developed on the inner margin of the hook.

The genus has not been figured outside Australia at present.

LABECERAS BRYANI sp. nov.

(Pl. XXXIX., figs. 4 *a*, *b*.)

1909 *Crioceras taylori* (pars, non olim) Etheridge Jr. (**30**), pl. 49, figs. 3, 5, 6 only.

Sp. Chars.—Micromorph, coiling ancyloceratid, with the aperture pointing towards the shaft; non-tuberculate; costæ very broad and, on the body-chamber, fairly widely spaced; cross-section subcircular, slightly compressed; aperture with rather long lappets; septal suture with broad saddles and narrow lobes.

Remarks.—This species is somewhat variable, to judge from the specimens examined. It is here restricted to the broadly costate forms with subcircular whorl-section. Etheridge (**30,** pl. 49, fig. 4), however, included in the species one form belonging to *L. laqueus*. In the holotype (pl. vi., fig. 4) the lateral lappet is visible at the aperture. Further the crioceratid portion of the whorl gave place to the straight limb at the base of the specimen, for there is an impression of the dorsum of the coil around it. The maximum thickness of the whorl is at the dorsum.

There is an interesting, though unfortunate, homœomorphic resemblance between *L. bryani* and *Toxoceratoides taylori* (Etheridge fil.), and the two had been grouped in the one species by Etheridge. *L. bryani* is a species from the Tambo Series whereas *T. taylori* is from low in the Roma Series. Small isolated fragments of the two are bound to be confused; but on complete specimens the closeness of coiling of the early whorls is a good distinguishing feature, while it is probable that, when discovered, the aperture of *T. taylori* will, in accordance with the general features of *Toxoceratoides*, not be directed towards the shaft as in *Labeceras*.

The species is named in honour of Mr. W. H. Bryan.

Locality.—South Central Queensland (A.M. Coll.).

LABECERAS LAQUEUS (Etheridge fil.).

1892 *Hamites* (or *Hamulina*) *laqueus* Etheridge Jr. (**42**), p. 496, pl. 42, figs. 14, 15.
1909 *Crioceras taylori* (pars) Etheridge Jr. (**30**), pl. 49, fig. 4 only.

Sp. Chars.—Micromorph, coiling ancyloceratid with aperture facing towards the shaft; cross-section circular; non-tuberculate; costæ thin, numerous.

Remarks.—This species differs from *L. bryani*, to which it is closely related, in the costæ being finer and more numerous, and in the whorl-section being circular. Etheridge, in a subsequent work (**30,** p. 160) confused his earlier species and appears to have regarded as *L. laqueus* the tuberculate form here separated as a new species (*L. trifidum*). But the holotype (**42,** pl. 42, fig. 14)

is non-tuberculate, and the species must be restricted to forms agreeing with this. Such a form was figured by Etheridge in 1909 (**30,** pl. 49, fig. 4) as *L. taylori*. Two species were figured by Etheridge in 1905 as *Anisoceras* (?) sp. (**28,** pl. 2, figs. 1-3); and these were later included in the synonymy of *L. laqueus* (**30,** p. 160). But two of the specimens are apparently *Hamites* while the third (fig. 3) may belong to *Labeceras* but is apparently not *L. laqueus*.

Localities.—Tower Hill (Q.M. Coll., holotype); South Central Queensland (A.M. Coll.).

LABECERAS COMPRESSUM sp. nov.

(Pl. XXXVI., fig. 5; pl. XXXIX., figs. 5 *a*, *b*.)

Sp. Chars.—Micromorph, coiling ancyloceratid with aperture facing towards the shaft, whorl-section compressed; non-tuberculate; costæ numerous, thin, slightly prorsiradiate; septal suture normal.

Remarks.—This species is notable for its very compressed section in which the height of the whorl is nearly twice the breadth. It is related to *L. laqueus* which it resembles in costation. On the holotype the lateral lappet at the aperture is well seen.

Locality.—Tower Hill, Muttaburra (Q.M. Coll.).

LABECERAS PAPULATUM sp. nov.

(Pl. XXXVI., fig. 4; pl. XXXIX., figs. 3 *a*, *b*.)

Sp. Chars.—Micromorph, coiling ancyloceratid with aperture facing towards the shaft; small dorso-lateral tubercles are developed on the body-chamber; costæ very thin, close together; whorl-section circular; septal suture with very broad paucidentate saddles and very narrow lobes.

Remarks.—This species is distinguished by (1) the papillate tubercles on the body-chamber, (2) the fineness of the ribs, and (3) the extreme narrowness of the septal lobes. It is perhaps related to *L. laqueus* to which, except for the development of tubercles, it is very similar.

Locality.—Longreach (B.M. Coll.).

LABECERAS TRIFIDUM sp. nov.

1892 *Crioceras sp.* Etheridge Jr. (**42**), p. 502, pl. 33, fig. 4.

1909 *Crioceras laqueus* (pars) Etheridge Jr. (**30**), pl. 49, figs. 7 and 9 (non fig. 8).

Sp. Chars.—Complete specimens unknown (? micromorph ancyloceratid); body-chamber with prominent dorso-lateral tubercles from which very fine but prominent ribs trifurcate. Whorl-section subcircular with rather flattened dorsum.

Remarks.—As holotype is taken a specimen (G.S.Q. Coll.) figured by Etheridge (**30,** pl. 49, fig. 9). The species in its tuberculation is closest to *L. papulatum* to which it is probably connected via such forms as a figured paratype (Etheridge, **30,** pl. 49, fig. 7). But it is distinguished from that species in the prominence of the tubercles, the thin flange-like ribs which trifurcate at the tubercles, and in its larger size. Three specimens have been figured, while a fourth has been examined by the writer. In all cases they consist of the initial part of the body-chamber and the suture line is thus unknown. But one of the specimens figured by Etheridge (**30,** pl. 49, fig. 7) shows that the shell previous to the body-chamber was non-tuberculate.

Labeceras in mode of coiling is homœomorphous with *Leptoceras* and *Acrioceras*; and it is a point of interest that, in the last-named genus, similar dorso-lateral tubercles are developed on the body-chamber in such species as *A. tabarelli* (Astier) (**4**, p. 19, pl. 7, fig. 9).

Localities.—15 miles S.W. of Hughenden (G.S.Q. Coll., holotype): Landsborough Creek (G.S.Q. Coll.); South Central Queensland (A.M. Coll.).

Genus **APPURDICERAS** nov.[40]

Genotype *Ancyloceras cordycepoides* Etheridge fil.

Diagnosis.—Micromorph shells with ancyloceratid coiling; strongly costate and with prominent ventro-lateral tubercles; septal suture I.U.L.E.

This genus includes two Australian and a number of foreign species. In the English Gault it is represented by *A. spinigerum* (J. Sowerby). The Wiltshire collection in the Sedgwick Museum contains a large number of complete specimens of *A. spinigerum*; and from an examination of these it seems that the early whorls of a species, usually in one plane (crioceratid), may often be slightly helicoid. *Hamites alternatus* Mantell may be a Lower Cenomanian member of the genus. At Folkestone the genus appears to be characteristic of the *auritus* zone (Spath, **99,** p. 76).

Appurdiceras is very similar to *Anisoceras* from which it differs in not having a medio-lateral row of tubercles; while the group of "*Hamites*" *elegans* d'Orbigny is another parallel development. *Anisoceras* is directly related to *Hamites* whereas there can be little doubt that *Appurdiceras* is derived from *Labeceras*; and the two genera therefore probably represent hamitid stocks independently developing tuberculation.

In the uppermost Aptian a group appears, typified by "*Ancyloceras patagonicum*" Stolley (**108,** p. 11, pl. 1, figs. 2, 3) which also has ventro-lateral tubercles only. This group extends into the Lower Albian at least to the *mamillatum* zone, but has no genetic relationship with *Appurdiceras*.

[40] From *Appurda*, which (fide Etheridge) is the name given to these fossils by the natives of the Lake Eyre region (from the resemblance to "purda," worms).

APPURDICERAS CORDYCEPOIDES (Etheridge fil.).

1905 *Ancyloceras cordycepoides* Etheridge Jr. (**28**), p. 14, pl. 1, figs. 3-5 ; pl. 2, fig. 4.

Sp. Chars.—Micromorph, coiling ancyloceratid ; costæ broad rounded close together, prorsiradiate, ventro-lateral tubercles strong, subcircular ; whorl-section subrectangular (rhomboidal) ; costæ bundled in groups of 2 or 3.

Remarks.—If the three specimens figured by Etheridge are the same species then the tubercles appear to have been septate ; for one shows long spines whereas two first specimens (casts) have truncate tubercles. There are some forms in the Wiltshire collection in the Sedgwick Museum from the Gault of Folkestone which are very similar to *A. cordycepoides*. Of the species figured by Sowerby perhaps *A. nodosus* (**92,** vol. iv., pl. 216, fig. 3) is the closest, but it differs in the inclination of the ribs.

Locality.—Dalhousie Springs (G.S.S.A. Coll.).

APPURDICERAS (?) ETHERIDGEI sp. nov.

(Pl. XXXVIII., figs. 2 *a*, *b*.)

Sp. Chars.—Micromorph, coiling ancyloceratid, with the aperture pointing towards the shaft ; costæ prominent rounded ; slightly compressed in cross-section ; ventro-lateral tubercles appear on the shaft only ; septal suture similar to that of *Labeceras bryani*.

Remarks.—This very interesting species agrees very well with *Labeceras* but for its tubercles. Coiling and septal sutures are identical with *L. bryani*. The early (crioceratid) whorls are not known ; but tubercles are not present on the early part of the shaft. This suggests that the species is an early form of *Appurdiceras*, although it may represent another branch from *Labeceras* with similar ventro-lateral tubercles.

The species is named in honour of the late R. Etheridge Jr.

Locality.—Kensington, W. Queensland (N.M. Coll.).

Family ANISOCERATIDÆ Hyatt emend. Spath.

Genus ANISOCERAS Pictet.

ANISOCERAS SP. NOV.

1909 *Crioceras sp.* Etheridge Jr. (**30**), pl. 35, fig. 2 ; pl. 46, fig. 2 ; pl. 47, fig. 5.

Whether the two specimens figured by Etheridge represent different species cannot yet be decided, although the lateral row of tubercles has not quite the same position in the two forms. The larger develops peculiar flange-like costæ on the body-chamber on which the tubercles tend to decline.

Pictet (**76,** p. 705) established the genus *Anisoceras* with *Hamites saussureanus* Pictet (**79,** p. 118, pl. 13, figs. 1-4) as genotype. But the large composite "specimen" illustrated, composed of several separate fragments, may include two genera and it is advisable to select fig. 2*a* as genotype and holotype. The genus should be restricted to the bituberculate hamitids of the Upper Albian and Lower Cenomanian.

The present species is related to *A. saussureanum* (restricted) but differs slightly in ribbing and tuberculation.

A. perarmatum Pictet et Campiche (**78,** p. 65, pl. 49) is somewhat similar but the ribs are finer and more numerous. On the Cenomanian *A. armatus* (Mantell) (**62,** p. 121, pl. 23, figs. 3, 4) the lateral row of tubercles is nearer the venter and the ribbing is different.

Locality.—Ward River watershed (A.M. Coll.).

Family ALETECERATIDÆ nov.

The four Upper Albian genera *Aleteceras, Myloceras, Flindersites* nov. (v. inf.) and *Algerites* Pervinquière (all characterised by openly coiled shells, very lytoceratid, and possessing ventro-lateral tubercles) are included in this family. The group is evidently a direct offshoot from *Lytoceratidæ* via *Cicatrites* Anthula (**3,** p. 100, pl. 7, fig. 6) which is markedly similar to *Aleteceras,* differing merely in not having crioceratid whorls and the septate (?) nature of the tubercles. *Cicatrites,* at present, is only known in the Caucasus where it occurs in the *aschiltaensis* zone (the topmost zone of the Aptian). How high it extends is of course unknown; but being a lytoceratid its range may be considerable. The type of ribbing of the *Aleteceratidæ* is decidedly lytoceratid;[41] while the septal sutures, which are of the I.U.L.E. type, agree in every detail with the *Lytoceratidæ,* particularly *Cicatrites.*

Algerites, which differs from the other genera in the relative smoothness of its whorls, is the only member of the family unknown in Australia; but the other three genera have not yet been recorded beyond Australia.

Genus **ALETECERAS** nov.[42]

Genotype *Crioceras plectoides* (Etheridge fil.).

Diagnosis.—Coiling crioceratid; whorl-section subcircular to subquadrate; costæ thin, usually reclined; large ventro-lateral tubercles at which the ribs are bundled usually in groups of three; septal suture I.U.L.E. with strongly bifid saddles and regularly trifid lobes.

[41] Compare e.g. *Aleteceras* and such ribbed lytoceratids as the Senonian *Gaudryceras cinctum* (Crick ms.) Spath (**98,** p. 118, pl. 9, fig. 3).

[42] ἀλέτης, a millstone.

Four species are known—*A. plectoides* (Etheridge fil.), *A. tardicostatum* sp. nov., *A. nautiloides* (Etheridge fil.) and *A.* (?) *axonoides* (Etheridge fil.). Both *A. plectoides* and *A. tardicostatum*, so far as is known, retain tubercles throughout life; but a change in type of tuberculation takes place in *A.* (?) *axonoides*, while in *A. nautiloides* a non-tuberculate stage succeeds the tuberculate. Although zonal collecting has not been made it is probable that the two latter species are later than the two former.

ALETECERAS PLECTOIDES (Etheridge fil.).

(Pl. XL., figs. 2 *a*, *b*, *c*.)

1909 *Crioceras plectoides* Etheridge Jr. (**30**), p. 152, pl. 33, fig. 2; pl. 46, fig. 1; pl. 47, figs. 1-4.

Sp. Chars.—Coiling crioceratid; whorl-section equidimensional, subquadrate; venter arched; costæ slightly reclined; ventro-lateral tubercle hemispherical, at which the ribs trifurcate; septal suture with saddles and lobes of equal size, moderately narrow-stemmed.

Lectotype.—Etheridge (**30**), pl. 46, fig. 1 (A.M. Coll.).

Dimensions.—

Holotype:	ϕ	160.	37.	—. 38.
(**30**), pl. 47, fig. 1:	ϕ	86.	40.	48. 36.
Pl. xl., fig. 2:		78.	42.	42. 35.

Remarks.—The first whorl, as in all members of the family as far as is known, is openly coiled (gyral). The tuberculate ribs in the younger whorl are more prominent than the non-tuberculate, varying numbers of which (from 3 to 10) are interposed between each pair of tuberculate ribs. The latter have a tendency to bifurcate near the umbilical margin, the two branches being united finally by the tubercle from which three ribs proceed across the venter. In later whorls the tubercle is often spread over three ribs, which do not subdivide further on passing the tubercle.

Localities.—Central or South-west Queensland (A.M. Coll., holotype); South Central Queensland (A.M. Coll.); Wellshot (G.S.Q. Coll.); Walsh River (Q.M. Coll.).

ALETECERAS TARDICOSTATUM sp. nov.

(Pl. XL., figs. 1 *a*, *b*, *c*.)

Sp. Chars.—Coiling crioceratid; costæ very numerous, close together, strongly reclined; tubercles subcircular, massive; in earlier whorls tubercles on about every fourth rib which trifurcates at the tubercle; in later whorls the tubercle spreads over three ribs and between are about eight non-tuberculate, simple ribs; whorl-section subrectangular; septal suture narrowly divided.

Dimensions.—Holotype (A.M. Coll.): θ 51. 90.

Remarks.—This species differs from *A. plectoides* in several respects—ribs are more numerous, closer together, and more reclined; whorl-section is slightly more compressed; tubercles are more prominent, and on later whorls tuberculation is different; and the branches of ES are more indented. Only the one specimen has been seen.

The tuberculation of the inner whorls is precisely similar to that of *A. plectoides*, but the tubercles are more massive while on later whorls the position of the tubercles joining three otherwise unaffected ribs is apparently constant (in *A. plectoides* this type is not constant on any individual.)

Locality.—South-Central Queensland (A.M. Coll., holotype).

ALETECERAS NAUTILOIDES (Etheridge fil.).

1909 *Crioceras nautiloides* Etheridge Jr. (**30**), p. 148, pl. 45 and text-figure 8.

Sp. Chars.—Coiling crioceratid; whorl-section depressed; sides convergent, venter evenly arched; early whorls with tuberculation of the *plectoides* type, later whorls non-tuberculate; costæ straight, reclined; septal suture with broad saddles and narrow lobes.

Remarks.—The species has been described in detail by Etheridge. The massive depressed whorls distinguish it from the other species. The tuberculation of the inner whorls is of the same massive type as that seen in the inner whorls of *A. tardicostatum*. Later whorls, while having costation essentially similar to the latter species, have lost all tubercles. The septal suture is not so indented as that of *A. tardicostatum*, being rather more like that of *A. plectoides*.

On account of the tubercles ceasing at a relatively early age Etheridge (**30**, p. 150) called attention to the similarity to "*Crioceras jackii*." Such similarity is, of course, purely morphic and there is no connection between the present species and *Australiceras*.

Locality.—Aramac (G.S.Q. Coll., holotype).

ALETECERAS (?) AXONOIDES (Etheridge fil.).

1909 *Crioceras axonoides* Etheridge Jr. (**30**), p. 150, pl. 32, fig. 4; pl. 44, fig. 1.

This species has been well described by Etheridge. It differs markedly from the other three in its wider umbilicus, the situation of the tubercles nearer to the central line of the venter, and by the ribs being almost directly radial. Eventually it may be necessary to remove it from *Aleteceras*. Tuberculation in early whorls is of the *Aleteceras* type; but on later whorls it is of the type seen in *Myloceras*. The flatness of the venter and the position of the tubercles are also more suggestive of *Myloceras* though the whorl-section is that of *Aleteceras*. The species may be an offshoot from *Aleteceras* developing somewhat parallel to *Myloceras*.

Locality.—"Queensland" (M.M. Coll., holotype).

Genus **MYLOCERAS** nov.[43]

Genotype *Crioceras ammonoides* (Etheridge fil.).

Diagnosis.—Coiling crioceratid; whorl-section compressed, rectangular; costæ thin, slightly curved, with small, simple tubercles on the ventro-lateral angles; septal suture I.U.L.E. with deeply bifid saddles and regularly trifid lobes.

Three species are known: *M. ammonoides* (Etheridge fil.), *M. orbiculus* sp. nov., and *M. davidi* sp. nov. The genus is remarkably similar to *Algerites* Pervinquière (**74,** p. 46), differing mainly in costation. From *Aleteceras* it differs in being more compressed and in having finer and more numerous tubercles at which the ribs are not associated in groups of three. The tubercles are mainly papillate and generally cover one rib only, though in some cases the ribs may be associated in pairs at the tubercles.

MYLOCERAS AMMONOIDES (Etheridge fil.).

(Pl. XLI., figs. 2 *a*, *b*.)

? 1892 *Crioceras edkinsi* Etheridge Jr. (**42**), p. 502, pl. 30, figs. 8, 9.
1909 *Crioceras ammonoides* Etheridge Jr. (**30**), p. 151, pl. 49, figs. 1, 2.
? 1909 *Leptoceras* (?) *edkinsi* Etheridge Jr. (**30**), p. 165.

Sp. Chars.—Coiling crioceratid; whorl-section very compressed, rectangular; venter flattened, sides subparallel; costæ very slightly flexed on sides, straight on venter, bearing small rather elongate tubercles on intermittent ribs; tubercles occasionally bundling ribs in pairs; costæ not bifurcating at the tubercles; septal suture not known.

Dimensions.— Holotype (G.S.Q. Coll.): ϕ 62. 39. 24. 40.

Remarks.—In the bundling of ribs in pairs at the tubercles the species is probably nearer to *Aleteceras* than any other member of the genus. This relationship is stressed by the size of the tubercles, which, though distinctly smaller than in *Aleteceras*, are somewhat larger than in any other species of *Myloceras*. In its compressed whorls the species is markedly distinct from the former genus and is the most compressed species in *Myloceras*.

The writer has examined the inner whorls of the specimen now figured. They are remarkably similar to "*Crioceras*" *edkinsi* but there is primitive bifurcation of the ribs at the tubercles, a feature not mentioned by Etheridge on "*Crioceras*" *edkinsi*. It appears, therefore, that *M. edkinsi* and *M. ammonoides* may be identical. Until that can be tested definitely the name *ammonoides* is retained. The genus has nothing to do with *Leptoceras*, to which Etheridge provisionally referred *M. edkinsi*; and the resemblance does not even extend to mode of coiling, for *Leptoceras* is an ancyloceratid micromorph.

Locality.—Port Douglas (G.S.Q. Coll., holotype); Dalhousie Springs (A.M. Coll.).

[43] μύλος, a millstone.

MYLOCERAS ORBICULUS sp. nov.

(Pl. XLI., figs. 1 *a*, *b*.)

Sp. Chars.—Coiling crioceratid; whorl-section compressed, with slightly convergent sides and very slightly arched venter; costæ thin, very numerous, slightly flexed on the sides, straight on the venter; tubercles very small, pappillate, on occasional ribs which do not bifurcate at the tubercle; costæ on the body-chamber non-tuberculate; septal suture with relatively broad, rectangular, bifid saddles and narrow regularly trifid lobes.

Dimensions.—Holotype (A.M. Coll.): 122 (95). 48. 34. 31.

Remarks.—One specimen only is known definitely. This is the most massive-whorled species of the genus and differs from the other forms, not only in width of whorl, but in the faintness of the pappillate tubercles. These are to be seen only up to the penultimate chamber, the body-chamber being non-tuberculate. The septal suture agrees well with that of *M. ammonoides* and it is probable that *M. orbiculus* is derived from *M. ammonoides* which it resembles in many ways.

The slightly greater curvature of the ribs at the end of the holotype suggests that the specimen is almost complete to the aperture and that the body-chamber was about half a whorl in length and had short lateral lappets.

Locality.—Beaconsfield (A.M. Coll.); West side of Ward River, 23 miles S.W. of Tambo (F.W.W. Coll.).

MYLOCERAS DAVIDI sp. nov.

(Pl. XXXVII., figs. 2 *a*, *b*, *c*.)

1909 *Crioceras sp.* Etheridge Jr. (**30**), p. 144, pl. 38, figs. 1, 2.

Sp. Chars.—Coiling crioceratid, whorls compressed; first whorls more loosely coiled than later; costæ thin, numerous, with small pappillate ventro-lateral tubercles; septal suture with rectangular saddles and deep very narrow L_1.

Remarks.—This species is closely related to *M. orbiculus*. In ribbing and tuberculation it is markedly similar to that species but differs in being more compressed and in the deep narrow lateral lobe of the septal suture. The septal suture of the first whorl, however, is very similar to that of *M. orbiculus*. The costæ on the specimen figured by Etheridge are straight; while on the holotype they are slightly flexed. This may not be a specific difference; and the curvature on the holotype is exaggerated by medio-lateral crushing.

Localities.—Bowen Downs, Thomson River (Q.M. Coll., holotype); Barcoo, Ward, and Nive Rivers area (A.M. Coll.).

Genus **FLINDERSITES** nov.[44]

Genotype *F. baccatus* sp. nov.

Diagnosis.—Coiling ancyloceratid; whorl-section subcircular to subrectangular, compressed; costæ straight or slightly flexed with ventro-lateral tubercles; apertures with short lateral lappets; septal suture I.U.L.E.

The genus is proposed for group of forms with ancyloceratid coiling. It is derived apparently from *Aleteceras* but develops differently in that, in later (?) forms, the ventro-lateral tubercle becomes thin and elongated as in *F. flindersi* (McCoy). The variety of forms present is amazing, and the number of specimens seen by the writer is entirely insufficient to determine the specific limits among the host of forms that have been figured by Etheridge (**42, 28,** and **30**). Those figures do not include all forms, for specimens seen by the writer belong to groups not depicted by Etheridge. The difficulty of making divisions within this assemblage was realised by Etheridge (**30,** p. 153), who grouped them all as *Crioceras flindersi* though pointing to several distinct types in the series.

The series requires separation; but all that is advisable to do here is to define several of the more distinct species, leaving a complete analysis for a further occasion when more specimens of the other forms are available.

FLINDERSITES BACCATUS sp. nov.

1909 *Crioceras flindersi* (pars) Etheridge Jr. (**30**), pl. 36, fig. 2; pl. 41, fig. 3; pl. 42, fig. 2; pl. 44, fig. 2.

Sp. Chars.—Coiling ancyloceratid; ventro-lateral tubercles hemispherical; costæ thin, sharply defined, in groups of two at the tubercle; whorl-section slightly compressed, subquadrate.

Remarks.—As holotype is taken a specimen figured by Etheridge (**30,** pl. 36, fig. 2; pl. 42, fig. 2; pl. 44, fig. 2). The early whorls are unknown. In its hemispherical tubercles this species is probably closer to *Aleteceras* than any other in the genus.

Localities.—Wellshot (G.S.Q. Coll., holotype); South Central Queensland (A.M. Coll.); west bank of Ward River, 23 miles S.W. of Tambo (F.W.W. Coll.).

[44] Named from its abundance in the Flinders River section. Since this paper was written Dr. Spath has shown the writer a species of *Myloceras* from Portuguese East Africa which has ancyloceratid coiling. Mode of coiling is therefore of questionable importance as a generic feature, and the name *Flindersites* may have to be abandoned. Differences in ribbing may, however, require it to be separated from *Aleteceras*; for the group seems natural from the point of view of ornamentation.

FLINDERSITES FLINDERSI (McCoy).

1867 *Ancyloceras flindersi* McCoy (**60**), p. 356.
1909 *Crioceras flindersi* (pars) Etheridge Jr. (**30**), pl. 39, fig. 1.

This holotype of this species was not figured by McCoy but has been figured by Etheridge. The ventral and apertural views, however, were not given. It is a gigantic species but still *very* imperfectly unknown.

Locality.—Head of Flinders River (N.M. Coll., holotype).

FLINDERSITES aff. FLINDERSI (McCoy).

1909 *Crioceras flindersi* (pars) Etheridge Jr. (**30**), pl. 39, figs. 2, 3.

This is a common type; but it is only known from fragments. Its relationship to *F. flindersi* cannot be determined until better specimens have been found. It has the same elongated tubercles and the same type of ribbing as *F. flindersi*.

Locality.—Flinders River (Q.M. Coll.).

FLINDERSITES aff. BACCATUS sp. nov.

1909 *Crioceras flindersi* (pars) Etheridge Jr. (**30**), pl. 40, fig. 4.

This form has similar tuberculation to *F. baccatus* but is rather wider and the costæ are bundled in groups of 3 or 4 at the tubercles.

Locality.—Saltern Creek (Q.M. Coll.).

FLINDERSITES INTERMEDIUS sp. nov.

1909 *Crioceras flindersi* (pars) Etheridge Jr. (**30**), pl. 40, figs. 1, 2.

Sp. Chars.—Coiling ancyloceratid; whorl-section subquadrate, equidimensional; venter very broad; costæ thin, flexed, prominently rursiradiate on approaching the ventro-lateral tubercles; tubercles blunt, elongate.

Remarks.—This species is peculiar in the course of the costæ. The tubercle is elongated as in *F. flindersi* but is intermediate in character between that of *F. baccatus* and *F. flindersi*. Certain other forms figured by Etheridge are closely connected (**30**, pl. 40, figs. 5, 6; pl. 51, fig. 1).

Localities.—Mount Cornish (Q.M. Coll., holotype); Longreach (Q.M. Coll.).

FLINDERSITES SP. NOV.

1905 *Crioceras flindersi* (pars) Etheridge Jr. (**30**, pl. 1, fig. 1; pl. 3, fig. 1).

This type with papillate tubercles is common but the writer has only seen fragments.

Localities.—Dalhousie Springs (G.S.S.A. Coll.); Beaconsfield (A.M. Coll.).

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Plate XXXIV.

(All figures natural size unless otherwise stated.)

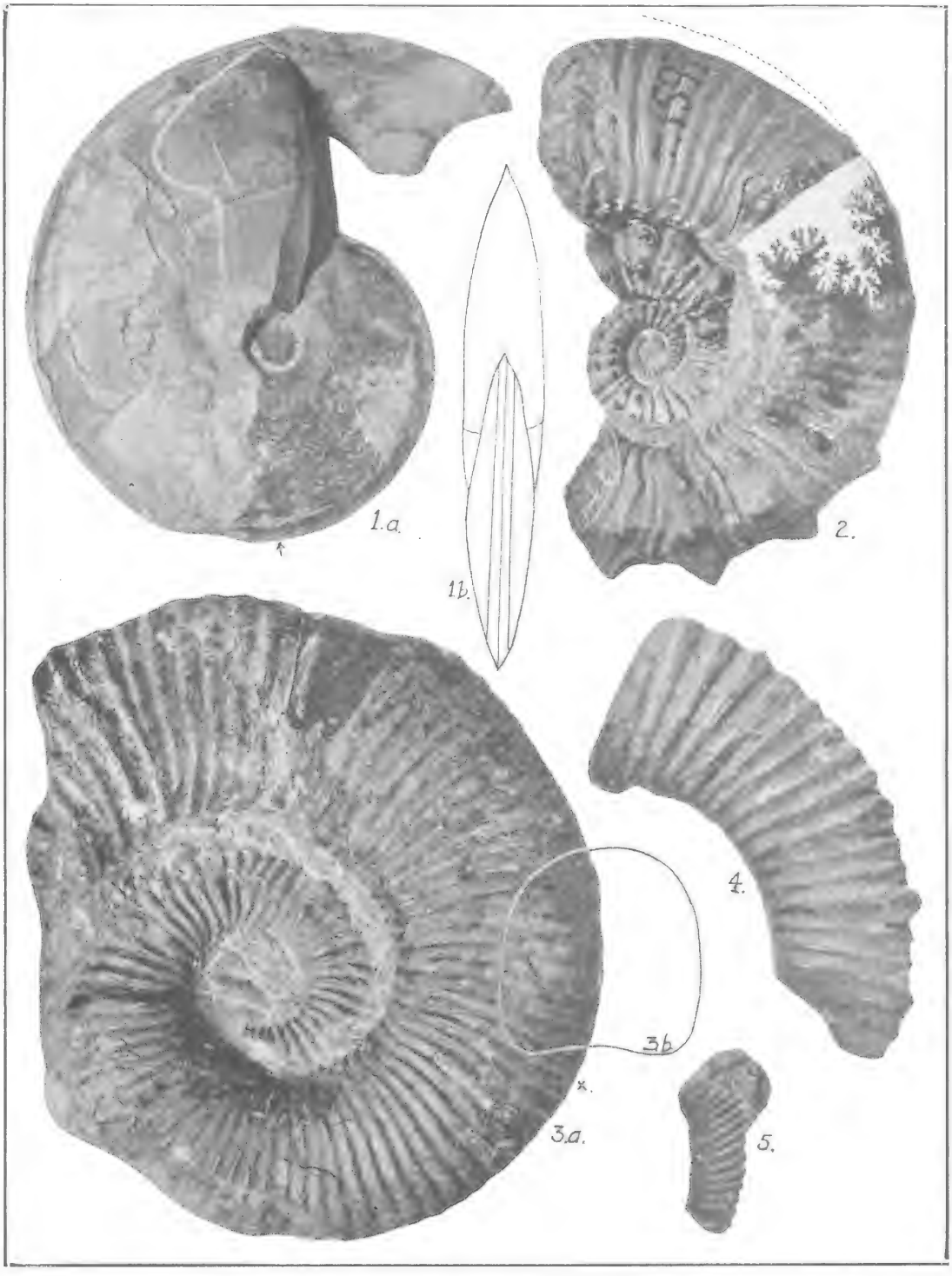
1. *Aconeceras walshense* (Etheridge fil.). (*a*) Lateral, (*b*) apertural view of topotype. The arrow indicates the beginning of the body-chamber. (See Pl. XXXVII., fig. 3). Walsh River (Q.M. Coll.); Roma Series (Lower Gargasian).

2. *Australiceras jacki* (Etheridge fil.). Topotype. Walsh River (Q.M. Coll.); Roma Series (Upper Bedoulian).

3. *Australiceras transiente* sp. nov. Holotype; (*a*) lateral view, (*b*) whorl-section taken at ×. Walsh River (Q.M. Coll.); Roma Series (Upper Bedoulian).

4. *Australiceras gracile* (Sinzow). Small fragment with whorl-section perfectly circular. Walsh River (Q.M. Coll.); Roma Series (Upper Bedoulian).

5. *Toxoceratoides taylori* (Etheridge fil.). Lateral view of fragment. Walsh River (Q.M. Coll.); Roma Series (Upper Bedoulian).



W. Tams, Photo.

Plate XXXV.

(All figures natural size unless otherwise stated.)

1. *Tropæum lampros* (Etheridge fil.). (*a*) Lateral view, (*b*) whorl-section taken at ×. See also Pl. XXXVII., fig. 4. Glendower Station, Flinders River (B.M. Coll.); Roma Series (Lower Gargasian). × 0·5.

W. Tams, Photo.

Plate XXXVI.

(All figures natural size unless otherwise stated.)

1. *Tropæum rarum* sp. nov. Holotype; (*a*) lateral view, (*b*) whorl-section taken at ×. Walsh River (Q.M. Coll.); Roma Series (Lower Gargasian). × 0·78.

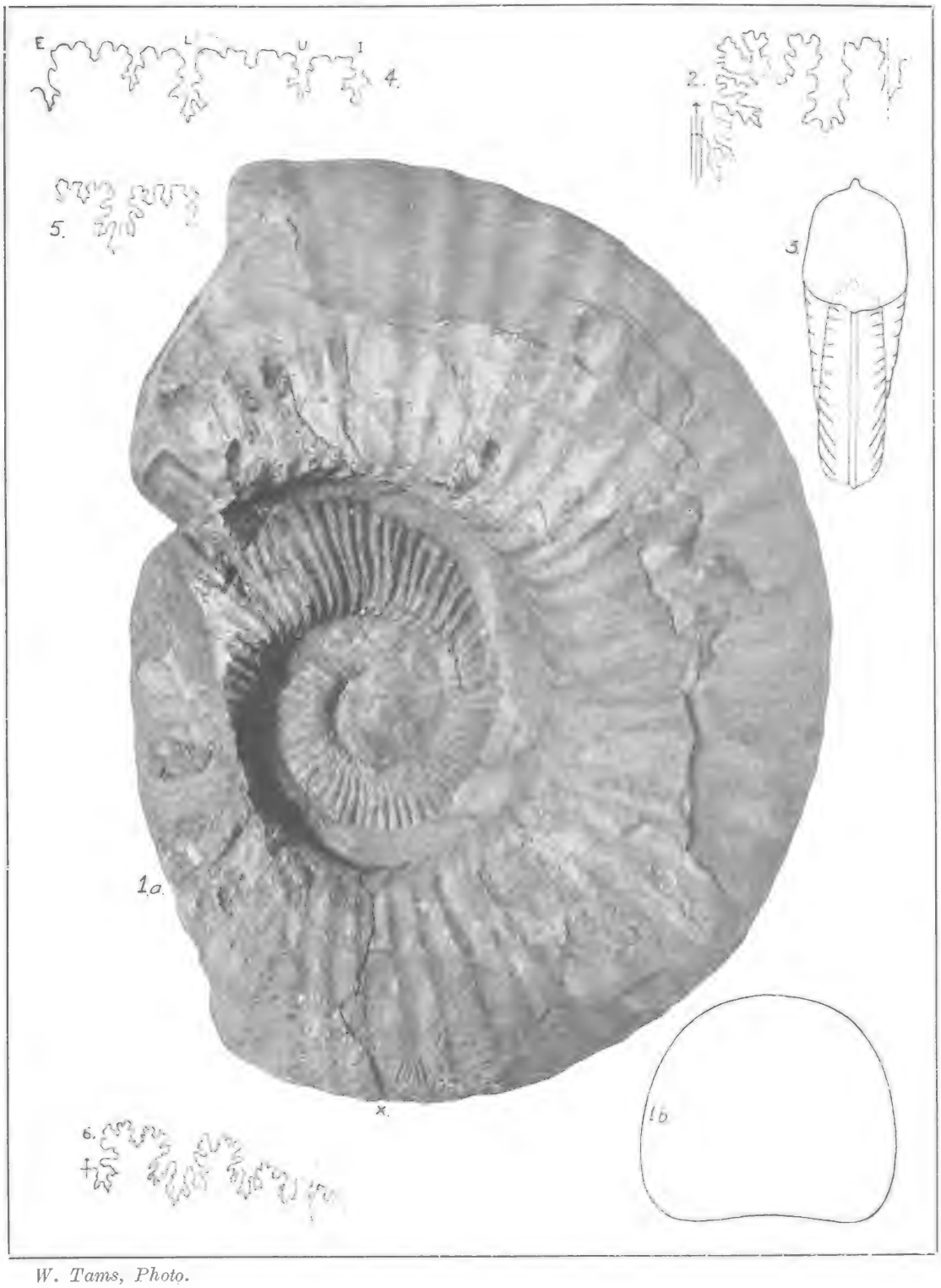
2. *Prohysteroceras richardsi* sp. nov. Septal suture of specimen from Ward River, 23 miles S.W. of Tambo (F.W.W. Coll.); Tambo Series (Upper Albian).

3. *Prohysteroceras richardsi* var. *nitidum* nov. Whorl-section of holotype. South-Central Queensland (A.M. Coll.); Tambo Series (Upper Albian).

4. *Labeceras papulatum* sp. nov. Septal suture of holotype (see Pl. XXXIX., fig. 3). × 2.

5. *Labeceras compressum* sp. nov. Septal suture of holotype (see Pl. XXXIX., fig. 5). × 1·5.

6. *Beudanticeras* cf. *flindersi* (McCoy). Septal suture of specimen from Hughenden (Q.M. Coll.). ×·2.

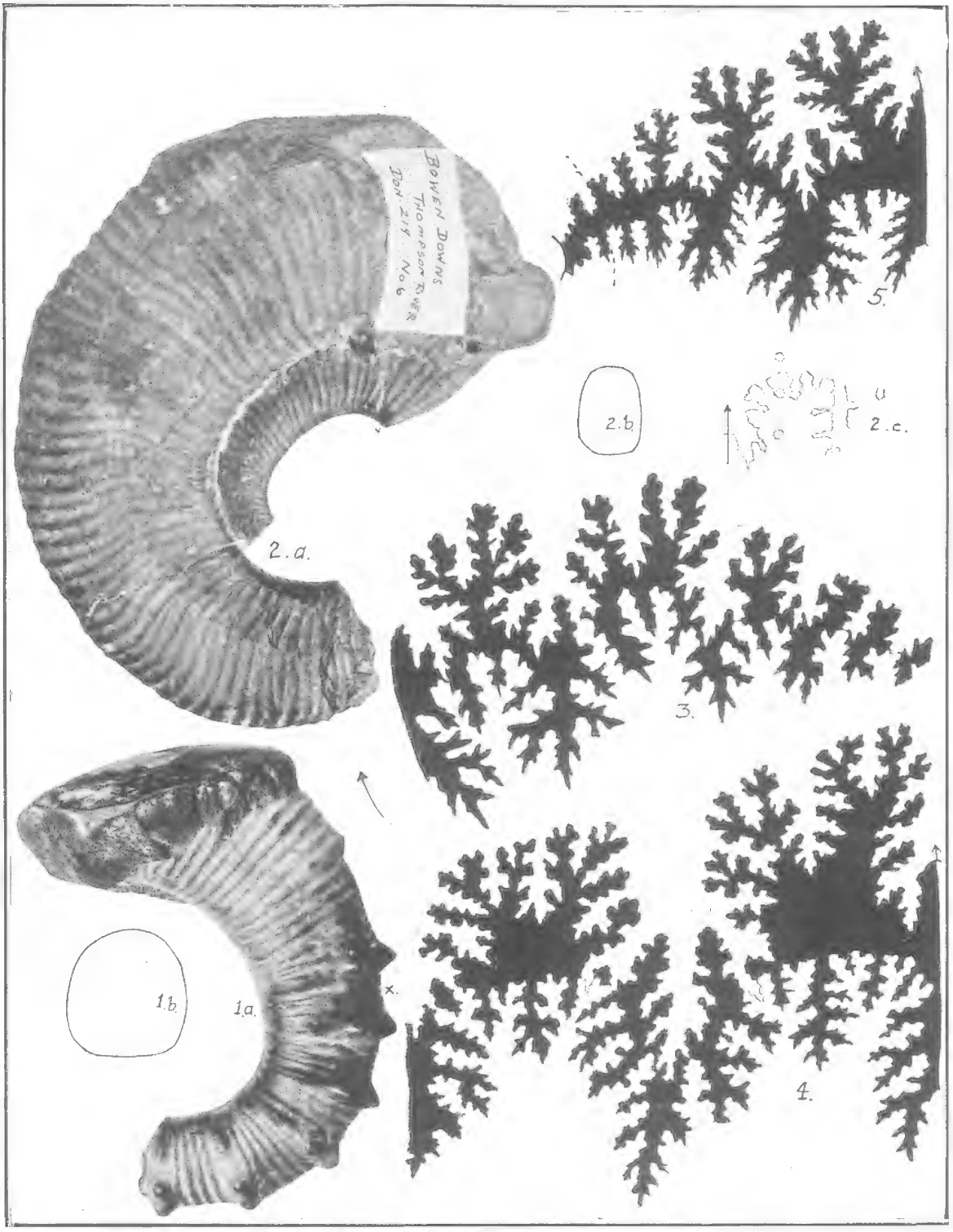


W. Tams, Photo.

Plate XXXVII.

(All figures natural size unless otherwise stated.)

1. *Australiceras irregulare* (Tenison-Woods). (*a*) Lateral view, (*b*) whorl-section at ×. Walsh River (Q.M. Coll.); Roma Series (Upper Bedoulian).
2. *Myloceras davidi* sp. nov. Holotype; (*a*) lateral view, (*b*) whorl-section at ×, (*c*) septal suture. Bowen Downs, Thomson River (Q.M. Coll.); Tambo Series (Upper Albian).
3. *Aconeceras walshense* (Etheridge fil.). Septal suture of specimen figured on Pl. XXXIV., fig. 1. × 4.
4. *Tropæum lampros* (Etheridge fil.). Septal suture of specimen figured on Pl. XXXV.
5. *Puzosia longmani* sp. nov. Septal suture of holotype. See Pl. XXXIX., fig. 1.



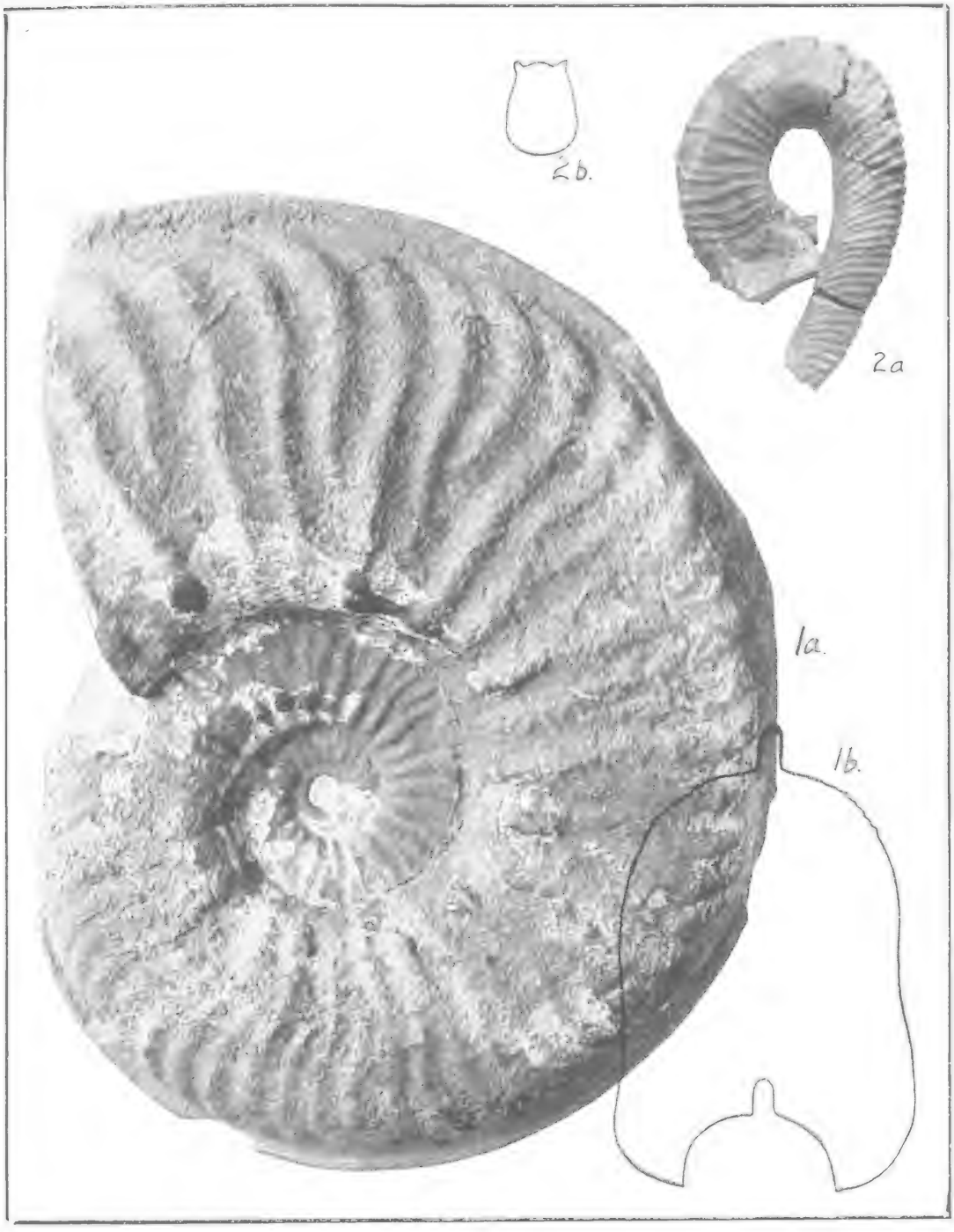
W. Tams, Photo.

Plate XXXVIII.

(All figures natural size unless otherwise stated.)

1. *Prohysteroceras richardsi* sp. nov. Holotype; (*a*) lateral view, (*b*) whorl-section. Augathella (Q.M. Coll.); Tambo Series (Upper Albian).

2. *Appurdiceras etheridgei* sp. nov. Holotype; (*a*) lateral view, (*b*) cross-section. Kensington (N.M. Coll.); Tambo Series (Upper Albian).



W. Sanderson, Photo.

Plate XXXIX.

(All figures natural size unless otherwise stated.)

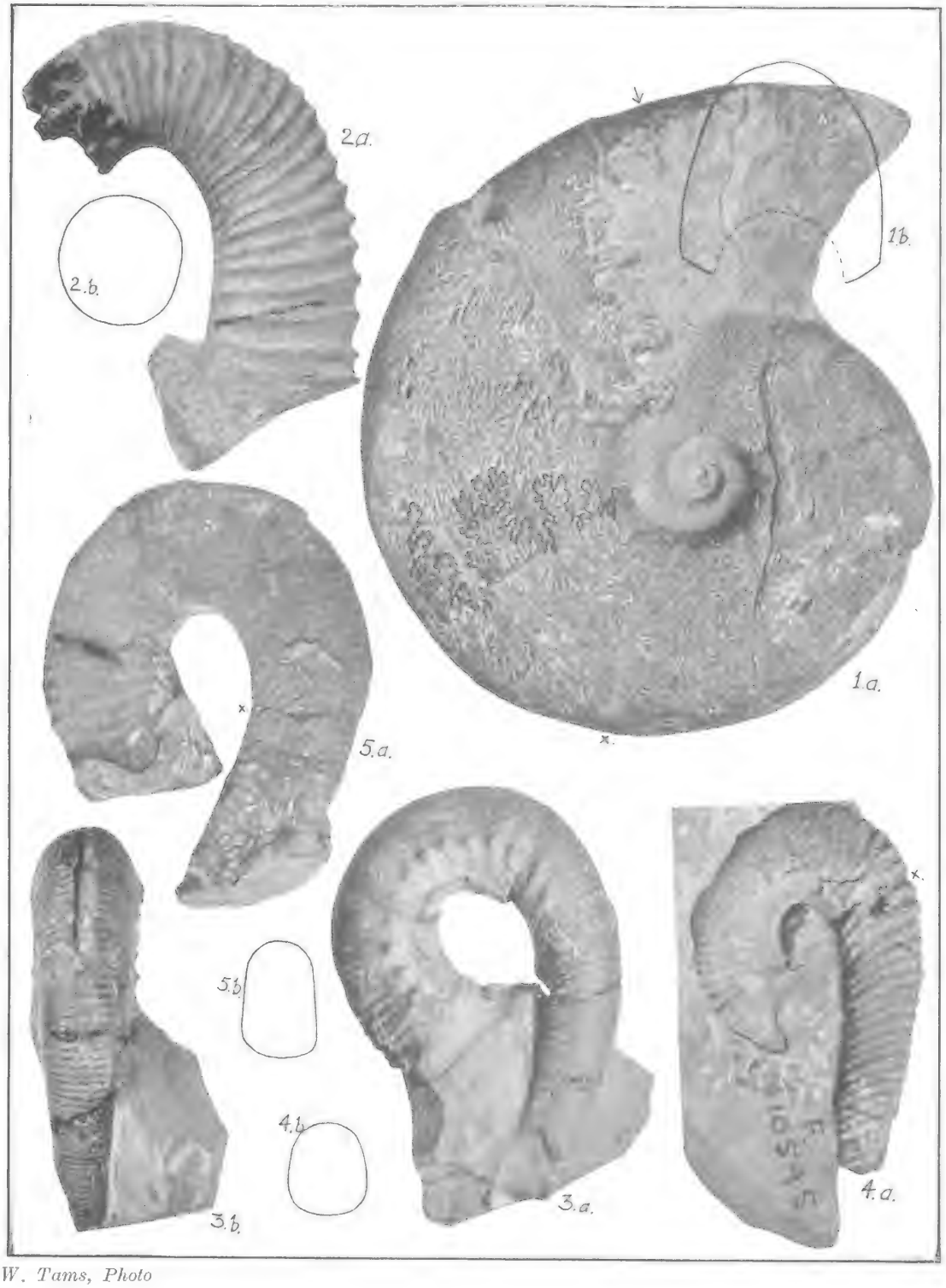
1. *Puzosia longmani* sp. nov. Holotype; (*a*) lateral view, (*b*) whorl-section ×. Beginning of body-chamber marked by arrow. Barcoo River (Q.M. Col.); Tambo Series (Upper Albian).

2. *Hamites* aff. *maximus* J. Sowerby. (*a*) Lateral view, (*b*) whorl-section at proximal end. Body-chamber. Ward River, head of Warrego (Q.M. Coll); Tambo Series (Upper Albian).

3. *Labeceras papulatum* sp. nov. Genotype, holotype; (*a*) lateral view, (*b*) ventral view. Longreach (B.M. Coll.); Tambo Series (Upper Albian).

4. *Labeceras bryani* sp. nov. Holotype, showing aperture. The impression of the dorsum of the spiral portion is preserved at the base of the specimen (not shown in the figure); (*a*) lateral view, (*b*) whorl-section at ×. South-Central Queensland (A.M. Coll.); Tambo Series (Upper Albian).

5. *Labeceras compressum* sp. nov. Holotype; (*a*) lateral view, (*b*) whorl-section at ×. Tower Hill, Muttaburra (Q.M. Coll.); Tambo Series (Upper Albian).



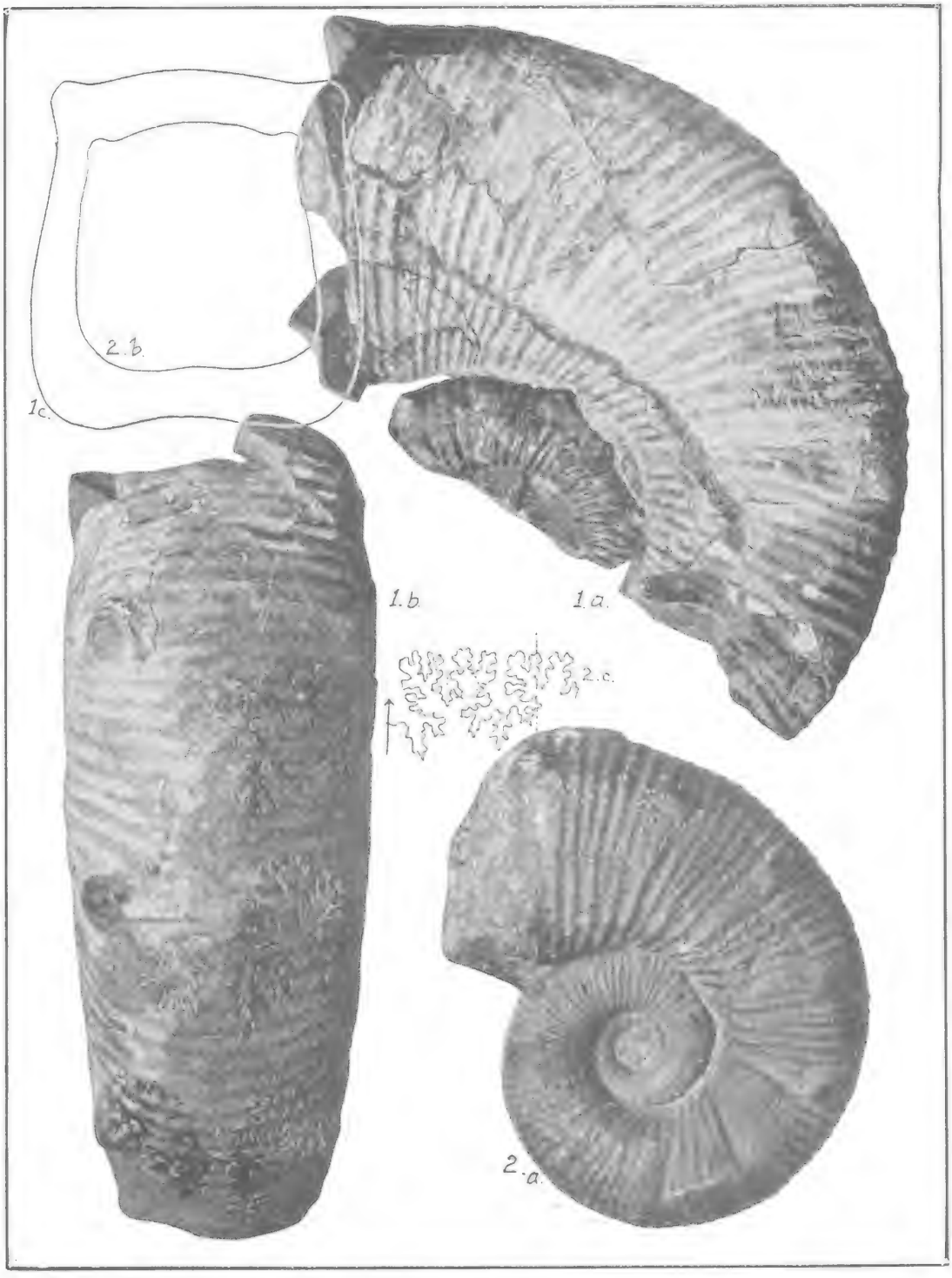
W. Tams, Photo

Plate XL.

(All figures natural size unless otherwise stated.)

1. *Aleteceras tardicostatum* sp. nov. Holotype; (*a*) lateral view, (*b*) ventral view, (*c* whorl-section at the distal end. South-Central Queensland (A.M. Coll.); Tambo Series (Upper Albian).

2. *Aleteceras plectoides* (Etheridge fil.). Young specimen; (*a*) lateral view, (*b*) whorl-section at the distal end, (*c*) septal suture. Walsh River (Q.M. Coll.); Tambo Series (Upper Albian).



W. Tams, Photo.

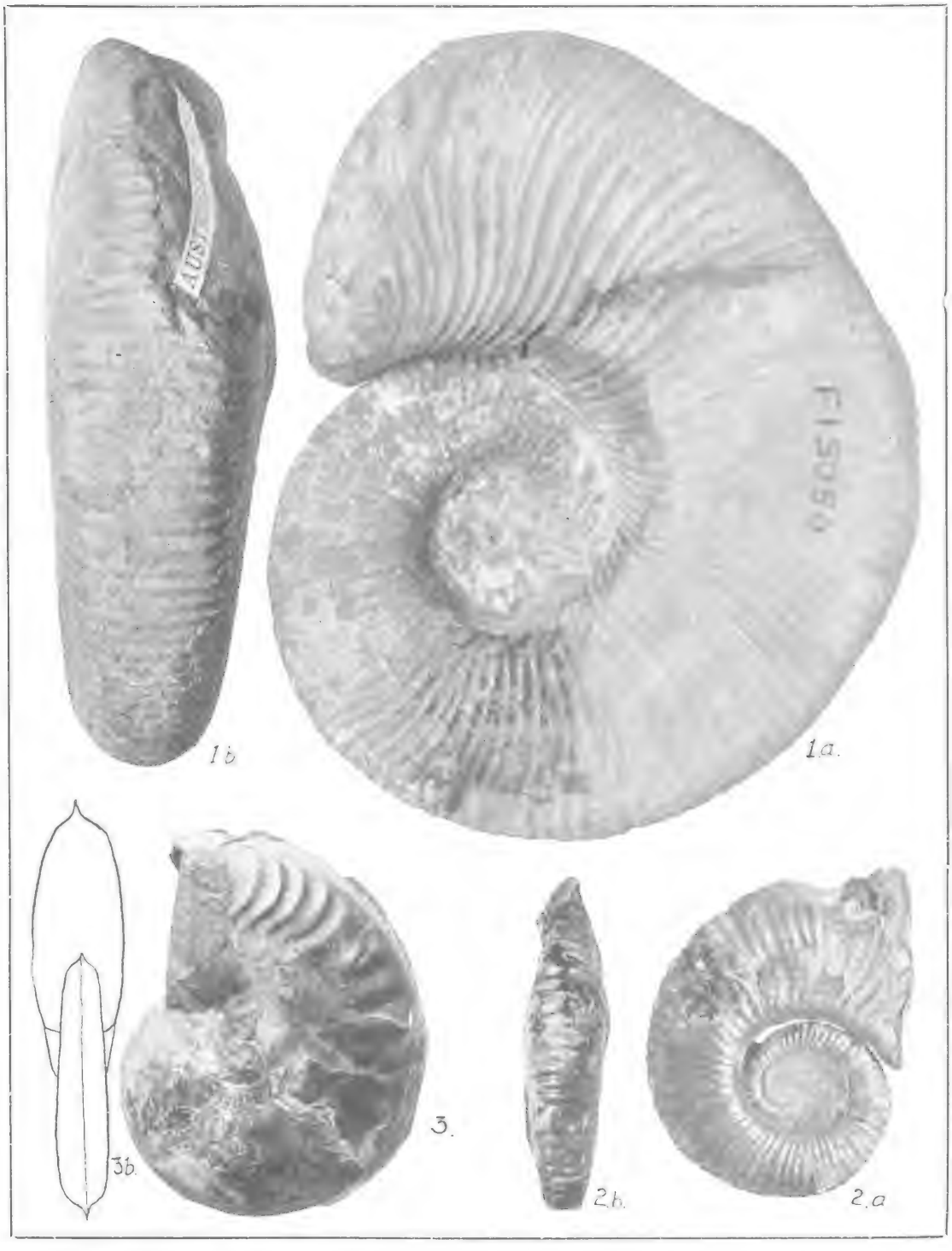
Plate XLI.

(All figures natural size unless otherwise stated.)

1. *Myloceras orbiculus* sp. nov. Holotype; (*a*) lateral, (*b*) ventral view. Penultimate chamber shaded. Beaconsfield (A.M. Coll.); Tambo Series (Upper Albian).

2. *Myloceras ammonoides* (Etheridge fil.). (*a*) Lateral, (*b*) ventral view. Dalhousie Springs (A.M. Coll.); Tambo Series (Upper Albian).

3. *Sanmartinoceras olene* (Tenison-Woods). (*a*) Lateral view, (*b*) whorl-section. Walsh River (Q.M. Coll.); Roma Series (Upper Gargasian).



W. Tams and W. Sanderson, Photo.

NEW SPECIES OF QUEENSLAND CERCOPIDÆ (HOMOPTERA).

By Henry Hacker, F.E.S.

(Plate XLII.)

CERCOPINÆ.

CLOVIA LOXOSEMA new sp. (Figure 1).

Female.—Head twice as wide as long, triangular, rounded apically, almost flat dorsally, finely punctate; pronotum anteriorly finely punctate, posteriorly more coarsely punctate-striate; scutellum finely punctate-striate; frons pitted down the centre, becoming smooth towards clypeus; clypeus pyriform, convex, smooth centrally; tegmina finely punctate.

Head, pronotum, and scutellum luteous; the head has three transverse brown stripes—the first following the outline of vertex, strongly arched, median and basal stripes less curved; the pronotum has four transverse stripes—the first slightly convex, the second straight, the third concavely curved, the fourth widened angularly at each side on the posterior border; ventral surface luteous, base and apex of frons blackish brown, with about seven brown oblique stripes on each side; clypeus black; rostrum flavescent, apex fuscous, extending to the meso-coxæ; tegmina fuscous, lighter apically; a broad pale stripe from costa before middle extends obliquely across corium and clavus, terminating near base; a curved pale stripe extends from just beyond middle of costal margin to apex of tegmen; another pale stripe runs parallel to the first mentioned, from the middle of corium to the posterior margin of clavus; the cubital and anal veins after passing this stripe continue pale; all light parts on tegmina more or less suffused with scarlet vermilion, which is brightest on the first-mentioned oblique stripe; legs fulvous, posterior pair flavescent. Length 13 mm., exp. 17 mm.

Male.—Tegmina uniformly fuscous, with all the above-mentioned pale markings bright scarlet vermilion; frons, excepting the extremities, luteous; oblique ridges concolorous.

Habitat.—National Park, Mount Tambourine, Q.; Tooloom, N.S.W. (H. Hacker).

Types in the Queensland Museum, *Ho. 3027.*

Described from twelve females and two males.

EOSCARTA CHINAI new sp. (Figure 2).

Female.—Head posteriorly declivous, apically flat, shape (excluding the eyes) semicircular, centrally longitudinally carinate; ocelli red, about twice as far from the eyes as from each other; outside the ocelli are two sulci, more separated anteriorly; frons smooth, anteriorly swollen, projecting crescent shaped beyond vertex when viewed from above, somewhat flattened along centre, with a row of obscure transverse ridges on each side; pronotum transversely punctate-striate, widest at base of tegmina; a central longitudinal carina, most distinct anteriorly, on each side of which is a smooth callose spot; scutellum as wide as long, finely transversely striate; tegmina rather narrow, subparallel, finely punctured; a groove at base below costa, in a line with which, just before middle, is a round embossed spot.

Head fuscous, lighter on sides of anterior margin, and posteriorly between ocelli and eyes; pronotum fuscous, lighter on each lateral angulation; scutellum and abdomen dorsally dark brown, pygofer lighter; frons black, apically fuscous; clypeus and rostrum light brown; legs brown, posterior pair yellowish brown, tarsi and tips of spines blackish, ventral surface of abdomen brown; tegmina fuscous, covered with fine light pubescence; a long triangular whitish patch on anterior border past middle, continuing to apex, nervures brown; wings hyaline, iridescent, nervures brown. Length of head and body 6 mm., exp. 14 mm.

Habitat.—National Park, Q. (H. Hacker).

Type in Queensland Museum, *No. 3028.*

Described from one female.

This species has been named after W. E. China, of the British Museum, to whom we are indebted for much assistance in identifying specimens.

PTYELUS HOMOCHROUS new sp. (Figure 3).

A large robust brown species, clothed with fine golden pubescence.

Female.—Head about four times wider than long, somewhat angularly rounded, anterior margin of vertex acute, centrally carinate, behind which is a large triangular impression; ocelli further from each other than from the eyes, in a shallow transverse sulcus; between each ocellus and eye is a small callose spot; pronotum finely punctate-striate, anteriorly rugate; a central sulcus, at the bottom of which is an impressed line, continuing on middle of pronotum as a feeble carina, which does not reach the posterior border; anteriorly, on each side of sulcus, are several obscure callose spots; scutellum longer than wide, finely transversely striated; frons moderately convex, on each side of which are eleven transverse ridges without pubescence; clypeus short, not passing anterior coxæ, centrally smooth; rostrum two-jointed, reaching meso-coxæ; tegmina with level surface, minutely punctured, elongate, anterior margins moderately arcuate; wings hyaline, dusky towards apical and posterior borders.

Head, body, and legs dark brown tinged with green; legs pubescent, spines and tarsal claws blackish; tegmina brown, darker along anterior border; eyes black; ocelli light red. Length of head and body 13 mm., exp. 32 mm.

Male.—Similar to female but smaller, length of head and body 10 mm., exp. 22 mm.; tegmina darker at base.

Habitat.—Brisbane, Q. One female on Acacia, 25th March, 1925; one male, Brisbane, 5th November, 1918. One male, Tooloom, N.S.W. (H. Hacker).

Types in Queensland Museum, *Ho. 3029.*

Described from three specimens.

The greenish tinge seems to be present only on recently captured specimens; in the male, captured in 1918, it is entirely absent, the colour being pure brown.

PHILAGRA FULVIDA new sp. (Figure 4).

Female.—Head as long as wide, slightly ascendant, compressed apically, with a dorsal carina, and a lateral one running to each eye, in front of which they become strong acute ridges; frons elongate, centrally smooth, with a number of oblique ridges on each side; clypeus smooth, rostrum reaching the intermediate coxæ; pronotum and scutellum punctate, the latter more finely; tegmina closely and finely punctured, amongst which are scattered many large impressed punctures; widest one-third from base, narrowing apically, costal margin strongly arcuate; entire dorsal surface covered with a fine golden pubescence.

Colour fulvescent; apex of cephalic prolongation, large punctures on tegmina, and two oblique fascia through centre of tegmina, fuscous; space on tegmina enclosed by fasciæ, an obscure fascia at apex of clavus, central stripe on frons and clypeus, luteous; wings dusky brown, iridescent, darker on apical margin; abdomen reddish brown; ovipositor blackish.

Length 11 mm., exp. 18 mm.

Male.—Differs from the female in its smaller size—length 8·5 mm., exp. 15 mm.—and its shorter almost wedge-shaped head, about as wide as long.

Habitat.—National Park (3,000 ft.), and. Mt Tambourine, Q. (H. Hacker).

Types in Queensland Museum, *Ho. 3030.*

Described from nine females and sixteen males.

Easily distinguished from *P. parva* Stål by the shorter and stouter cephalic prolongation, the large dark punctures, and the differently shaped fasciæ on tegmina.

PHILAGRA CONCOLOR new sp. (Figure 5).

Female.—Head produced, somewhat tapering, inclined upward, acutely pointed, with carina as in *P fulvida*; frons and clypeus have a smooth light central ridge, sides of frons have a series of oblique ridges; punctures on head, pronotum, and tegmina somewhat finer than in *P. fulvida*; tegmina finely punctured with larger scattered punctures among them; the whole dorsal surface is the same shade of fulvo-olivaceus, excepting the tapering apex of head, and the extreme tips of tegmina, which are fuscous; apical half of rostrum, anterior tarsi, intermediate claws, tips of spines and the claws on posterior legs, blackish; abdomen reddish brown, anal style and ovipositor fuscous. Length 10·5 mm., exp. 16 mm.

Male.—Head slightly shorter and stouter than in the female; size smaller—length 9 mm., exp 14 mm.

Habitat.—National Park, Mapleton, Southport, Q.; Tooloom, N.S.W. (H. Hacker); Mt. Tambourine, Q. (W. H. Davidson).

Types in the Queensland Museum, *Ho. 3031.*

Described from eight females and ten males.

Close to *P. fulvida*, but differs in the immaculate tegmina, without any indication of either light or dark fascia; the more tapering prolongation of head, and slightly finer puncturation.

BATHYLLUS ALBICINCTUS (Er.).

Erichson's description is from a male. The female is without the basal pronotal white stripe, the head, pronotum, and scutellum being pale brown, unicolorous; tegmina pale brown; the curved white fascia does not enter the clavus, as in the male, but in some specimens is indicated by a small white spot near the apex; apical half of tegmina white, reticulate; nervures on apical part white, narrowly bordered on each side with light brown.

Hab.—Peel Island, Moreton Bay (W. A. T. Summerville), October. Occurring in numbers on a creeping vine growing near the beach.

MACHÆROTINÆ.

POLYCHÆTOPHYES PERKINSI new sp. (Figure 6).

Female.—Head transverse, triangularly produced, extending in front of eyes about the width of one; ocelli in centre of vertex, close to each basal corner of frons, which is on the dorsal part of head; frons dorsally about one-third the width of vertex, widening slightly and swollen ventrally; pronotum wider than head, coarsely but shallowly transversely wrinkled; scutellum triangular, longer than wide, finely striated, apex acute; tegmina nitid, coarsely punctured; nervures forming raised ridges on surface; wings hyaline, iridescent, apical half with minute hairs.

Head dorsally, anterior border of pronotum, scutellum, and pleura yellow; pronotum, excepting anterior border, pale green; front below a straight line level with eyes, clypeus, legs, and abdomen, black; tegmina nitid, varying from castaneous to nigricent (according to maturity), the blackish tegmen viewed by transmitted light is castaneous with an opaque triangular patch at base of costal area, and two obscure paler spots arranged diagonally just beyond. Length of head and body 6 mm., exp. 15 mm.

Habitat.—Stanthorpe, Q. (F. A. Perkins).

Types in the Queensland Museum, *Ho. 3032.*

Described from two females.

POLYCHÆTOPHYES APPENDICULATA new. sp. (Text-figure 1).

A brown species distinguished by a large rounded appendix on each tegmen, which in repose is bent around the posterior extremity, overlapping.

Female.—Eyes black, narrowly bordered with light brown; clypeus rounded, swollen, with transverse parallel brown stripes; rostrum light brown, tip darker, reaching to intermediate coxæ; pronotum large, declivous at sides

Text-figure 1.

strongly transversely striated, posterior margin deeply excavated in the middle; scutellum twice as long as wide, more finely striated; tegmina pale yellowish brown, subhyaline; a brown fascia crosses tegmen about centre, darkest on costa; a few cross-veins in costal cell; nervures light basally, becoming darker towards apex of tegmen, where they are cut off by an oblique line, beyond which is a rounded, parallel-sided appendix; clavus pale basally, the remainder brown, claval vein forks about middle.

Head, pronotum, and scutellum reddish brown, tip of scutellum whitish; abdomen dorsally black, the two basal segments centrally whitish, ventral surface and genitalia brown; legs brown, posterior tibiæ, spines and claws blackish.

Length (wings closed) 5 mm., breadth 3 mm.

Hab.—Bunya Mountains, Q. (3,000 ft.), December (H. Hacker).

Type in the Queensland Museum, *Ho. 3051.*

Described from one female.

EXPLANATION OF PLATE XLII.

Fig. 1.—*Clovia loxosema* n. sp., ♀ (Upper) ♂ (Lower), x 3.

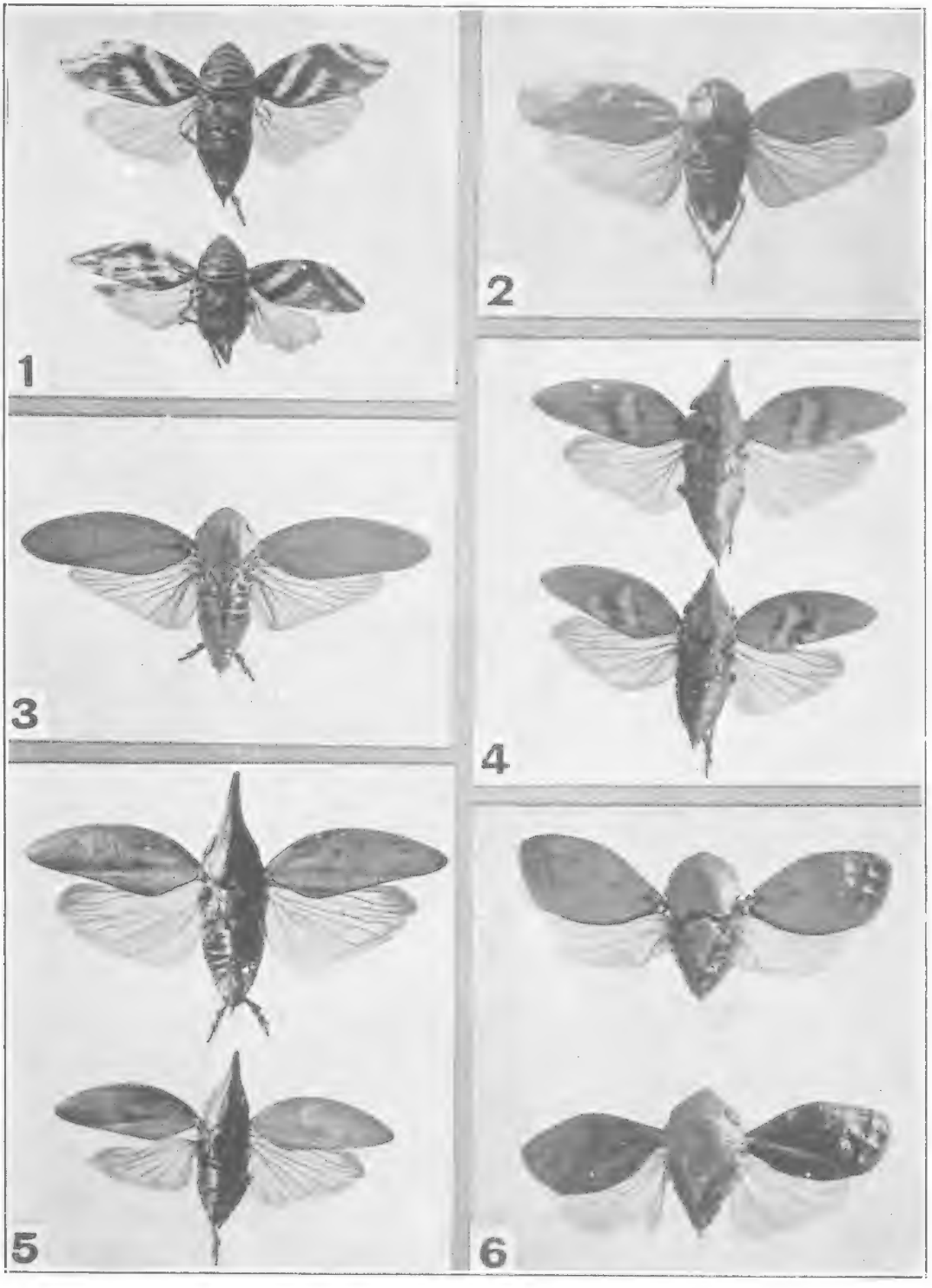
Fig. 2.—*Eoscarta chinai* n. sp., ♀, x 4.

Fig. 3.—*Ptyelus homochrous* n. sp., ♀ x 1·8.

Fig. 4.—*Philagra fulvida* n. sp., ♀ (Upper), ♂ (Lower), x 3.

Fig. 5.—*Philagra concolor* n. sp., ♀ (Upper), ♂ (Lower), x 3·5.

Fig. 6.—*Polychætophyes perkinsi* n. sp., ♀ ♀, x 3·5.



Queensland Cercopidæ.

Photos., H. Hacker.

Face page 248.

CUSTOMS AND LANGUAGE OF THE WESTERN HODGKINSON ABORIGINALS.

By Francis Richards.

The tribe under review is known as the "Wakoora," and inhabited an area of about 40 sq. miles, centring on Mt. Mulligan (west from Cairns, North Queensland), living mostly on the top and the western slopes of that mountain. Two other tribes, viz., "Chunkunberry" and "Wun-yurika," had almost identical language and customs. The latter extended along Mulligan Creek, south of the southern end of Mt. Mulligan, an area of about 60 sq. miles; the former lived from where Thornborough now is to Deep Creek, an area also of about 60 sq. miles. All this country is rugged, rocky, and sparsely wooded.

The customs of these tribes are somewhat similar to those noted by Mowbray for the tribe living in Granite Ranges at the head of Mitchell River.[1]

History.—In their original wild state these tribes probably numbered about 200 in each. Their numbers were rapidly diminished following contamination with the whites and Chinese on the opening of the Hodgkinson Goldfield in 1875, mainly by native police, influenza, and venereal disease. It is probable that the Wakoora was the dominant tribe, as they outlived and absorbed the other two. By 1890 the Wakooras and Wun-yurikas had coalesced, with great enmity between them and the Chunkunberries; but by 1900 the Chunkunberries had come down and merged with the other two, with headquarters around Woodville. Since then these tribes have gradually dwindled away, until at present about twenty remain—mostly original Wakooras. These survivors are all old, the young "bucks" and "gins" having passed out under combined stress of the evils of whites and Chinese.

Clothing, Ornaments, and Vessels.—The whole tribe lived together in several camps. They built humpies and lived in them during cold or wet weather. These humpies were built of flexible pieces of bush timber bent over to form a beehive-like structure, thatched with tea-tree leaves and bark. They were 3 to 4 ft. high, and had one small entrance, before which at night a fire was built, serving the double purpose of keeping them warm and repelling the mosquitoes.

[1] E. W. Mowbray, in "The Australian Race," by E. M. Curr, vol. II, pages 402-407, 1886.

Editor's Note.—Mr. Francis Richards has been familiar with the aboriginals of the Mount Mulligan district since boyhood, having lived in close contact with them for about forty years. He desires to acknowledge the very able assistance given by Dr. T. M. S. Hall in the preparation of this paper.

They wore no clothing, but on cold nights covered themselves with tea-tree bark and slept in their humpies or behind breakwinds of bushes and bark, surrounded by little fires. For ornaments they wore feathers in their hair, necklets of grass beads (made by threading segments of grass on string), and sometimes a single large white shell was suspended around the neck. Numbers of small pieces of mussel-shell would be squared by rubbing on stones, bored, threaded on string, and tied round the forehead. The string for these purposes was made from the inner bark of the currajong tree. I never saw quartz worn as an ornament.

They made paints of red or white clays mixed with water or saliva (I never saw grease or fat used for this purpose), and painted their whole bodies, usually in stripes. They scarred their bodies by cutting with quartz stones, and were able to raise scars to a height of about $\frac{1}{2}$ in. above the skin. These scars were confined to the chest, shoulders, and upper arms; a few scarred their noses. Though painting was limited to males of all ages, both sexes scarred themselves. The right central incisor was knocked out with a stone, and the septum of the nose was pierced with a sharp stick and a piece of grass about 3 in. long was worn through it.

Circumcision or operations on the urethra were not practised; in fact it was considered a matter for great merriment among the rest of the tribe if a member had a short foreskin (charra-galah). A bald head was held in the same ridicule, though I only knew one Wakoora to have a bald head. Before the advent of the whites, these natives lived to a great age. I knew a number of very old men and women, some blind with age and snow-white.

Women carried only one type of bag. This was made very cleverly of knitted grass, and was suspended from the head with string made from the inner bark of the currajong. The men carried small, narrow, string bags about 1 ft. long, and these were used to carry spear-making implements, wax, gum, sinews, sharp stone, the fire-maker, &c.

Their only vessel was made from the soft inner bark of the ironbark. It was fashioned into the shape of a boat, each end being secured with a wooden spike. In this vessel yams were prepared for eating by being scraped with mussel-shells into a pulpy mass, or figs pulped with the hand. In it infants were also carried by the mother, suspended from her back by a band placed on her forehead. A smaller type of the same vessel was used for holding drinking water.

Fire was made by rubbing sticks together. A piece of round hard-wood 1 ft. long, the thickness of a lead-pencil, was rapidly rotated between the palms of the hands in a small depression in dry, soft wood. Turn-about was taken in rotating the stick. As soon as it began to smoke, they sprinkled ground-up tea-tree bark on the glowing point, and this was blown into a flame. This process usually took about five minutes. At most times a large fire was kept always alight in the camp, in charge of the gins.

Foods.—Their food consisted of any animal, bird, reptile, or fish that they could catch, and eggs, yams, and fruits. Children and women were not allowed to eat the most succulent foods, such as plain turkey, black duck, goanna, emu, etc. They believed that they would break out in sores if they ate these foods, and consequently never touched them. The wisdom of this from the buck's point of view is obvious. They cooked all meat but ate yams and fruit raw. Cooking was done on open fires or in primitive ovens made of flat stones. The oven was a hole in the ground, lined with hot stones into which the meat was placed and covered with tea-tree bark. The hole was then covered with earth. All animals were cooked whole and uncleaned.

Cannibalism was practised, but was limited to members of other tribes. They never ate their children; on the contrary great love was manifested by parents to both their children and relatives.

Hunting.—The game was obtained by the males; fruits, yams, and fish (by the "grass" and poison methods) by the females. They hunted the kangaroo by two methods. The usual was to stalk and spear the kangaroo, the hunter being covered with green bushes or grass. The other method was to surround an area with bush fires, leaving a narrow space at one point. The kangaroos were speared or killed with nulla-nullas as they rushed through the opening. The rock wallabies were roused by shouting and killed by throwing nulla-nullas at them. Emus and plain turkeys were stalked in a similar manner to the kangaroo. Ducks were speared in the water, the hunter being immersed, with his head disguised with water-lily leaves. 'Possums, bush rats, and native cats were located in hollow trees by throwing stones into the hollows and listening for the sound of the stone falling on their bodies. When one was discovered the tree was cut open with tomahawks.

They had three methods of fishing. When the rivers were full the fish were speared with a special fish-spear. When the water was low the fish in the waterholes were poisoned with the fruit of a species of acacia known locally as the soap tree, or with the leaves of a tree called by them "Rukka." This tree resembles the guava tree. These poisons made the fish rise to the surface, where they were speared. The third method was employed in shallow holes. A barrier of grass was rolled from one end of the hole to the other, driving the fish before it, where they were caught by hand.

These people never stored food. It was either a feast or a famine with them. As I remember these natives, they were always well nourished and strong.

Marriage.—Marriages were made within the tribe except when gins were acquired by conquest. Marriage between close relatives was strictly forbidden.

and never occurred. The greatest insult that could be offered one of these natives was to insinuate that he was guilty of incest. Wives were never bartered. Occasionally a native would take another man's wife, the ownership of the lady then being decided by combat. Some men had as many as three wives.

Marriages were contracted in four ways—

(1) A youthful gin would be given by her parents to the man. The woman was generally about the age of puberty, the man being about twenty.

(2) The usual method, between young couples of about equal age, was for the couple to run away and remain in the bush, alone, for a few days. When they returned they were considered married.

(3) When couples of mature years wished to marry, the man would light a fire and pitch his camp near that of the woman. When she went and slept with him they were married.

(4) A man would forcibly detain a woman, and if he could hold her she was his. The methods of detention were drastic. I have known women to be tied up for days and beaten until they became tractable.

A peculiar custom existed in regard to eloping with another man's wife. The couple would run away and live in the bush for several days. In the meantime the husband was going around vowing vengeance. On their return the couple declared that the "Eekoo" or "mountain devil" had taken and detained them. They always extended the tale to rape for the woman and sodomy for the man by the "Eekoo." This excuse satisfied the husband, who thereupon resumed normal relations with his wife.

There were no ceremonies of any kind in connection with marriage. Husbands and wives were not as a rule very faithful to each other.

Abortion was very common, and was procured by the woman taking a very long walk and then jumping into a waterhole from a height of about 20 ft., with arms and legs spread and body leaning a little forward. This method was reputed to be unfailing.

Dancing and Games.—They had three types of corroboree, and these were their only dances. No fixed periods were observed, although they preferred moonlight nights. They were held at irregular, frequent intervals; there was scarcely a week went by without one. Sometimes the dances were held in an open space without preparations, but usually they built a break-wind of two lines of bushes and danced between the two. On rare occasions they would erect two painted sticks, resembling barber's poles. The men were always well painted and decorated for the occasion, and small fires would give sufficient light.

In the most common dance the gins would sit in a semicircle and with their hands together would beat between their thighs, making a noise somewhat resembling a drum, which could be heard for half a mile. There was only one singer. He always stood at the right-hand end of the semicircle of women. He would beat time by knocking boomerangs or other sticks together, and sing. The dancers, consisting of men, would march up in anything from single file to fours. They stamped their feet, and jerked their clenched hands in time with a grunt which they emitted at each stamp. The man at the rear of each file always kept his hands clasped behind his back. The singer sang with one breath, and when his voice stopped for breath the dance ended with a loud yell from the dancers, who immediately turned and raced back to the starting point. This procedure was repeated indefinitely, the corroboree often lasting up to four hours.

In the second dance, the gins and singers are arranged as before, but the dancers—stamping, grunting, and jerking their clenched fists—march in a circle around a man lying on the ground going through contortions meant to imitate masturbation. As before, the singer's exhaustion ends the dance.

The third dance was performed without singing and was a solo dance. The dancer, who was always a man, simultaneously beat his elbows against his ribs, clapped his hands in front of his abdomen, shook his legs, feet apart, and blew out of his mouth, making the sound "tremble" with his lips.

In all dances, up to about twenty men and a corresponding number of women would be participating, the rest of the camp being spectators. Some natives were noted and admired for their corroboree singing.

Games.—These tribes played three games, the simplest of which was target practice with spears. The target was of bark placed in the sand, and spears were thrown at it from a distance of about 50 yds.

In another game a circle of green bark was cut about 8 in. in diameter, and thrown crosswise along the ground like a wheel in front of a number of men who threw spears at it as it passed. They seldom missed their mark.

The third game took place only once a year and was played every day for about a week. During this period all the men had a piece of string tied tightly round their heads, under the ears and over the nose, about half an inch from the tip. The effect of this was to flatten the nose and completely prevent nasal respiration. The game was a kind of wrestling, and took place in the sand of the river bed, at a certain time every afternoon. Two heaps of sand about 1 ft. high were built up about 15 yds. apart, and called "the baby" (karkoo). Immediately in front of each karkoo was an equal number of wrestlers and immediately behind it a club was placed on the sand. A man from each side advanced, met in the middle,

and wrestled. The winner of this match ran to the opposing side's karkoo, lifted the stick and hit the karkoo on its supposed head, then returned to his side. The loser dropped out of the game. The winners were the side who last held the field.

Fighting.—Their offensive weapons consisted of spears, throwing sticks, nulla-nullas (used as clubs for throwing), boomerangs, and stone tomahawks. The boomerang and nulla-nulla were made from any hard wood, mostly ironwood, by cutting with stone tomahawks, and were polished with the rough fig-tree leaf. These tribes were not very skilful at throwing boomerangs, depending on their spears and nullas when fighting.

One type of war-spear was made of ironwood, tipped with soft wood at the throwing end and bound with beeswax or cypress pine gum and sinew. It had a barb of ironwood bound on with sinews. The other type of war-spear, instead of a hardwood barb, had a number of pieces of quartz imbedded in beeswax, cypress pine gum, or grass-tree gum.

All spears had a small notch in the throwing end for the throwing stick. This notch was also bound with sinew. The fish-spear, up to 6 ft. long, was made with four prongs of hardwood each 1 ft. long, bound with sinews and sometimes barbed.

In the making of these war-spears the proportion of hard and soft wood varied. In some the hard wood was slightly less than half the total length of the spear (kulka). In others there was only about a foot of soft wood (marnoo). The latter were considered the better spears. The wax on a finished spear was always brightly polished with saliva and the leaf of the pandanus tree. A peculiar point in the making of these spears was that the man used the thick skin of his heel as a chopping block while shaping spears with tomahawk or shell.

The tomahawks were made of very hard stone ground to a sharp edge and fashioned to a blunt point at the back. The head was fastened to a split handle with sinews. The throwing stick was made from flat ironwood about 1 yd. long by $2\frac{1}{2}$ in. broad at the widest part. It tapered only slightly. The handle consisted of beeswax or gum, often covered with a pair of polished mussel-shells secured with sinews. Sometimes the handle was made of a piece of pliant bush timber filled in with gum and fastened with sinews. The opposite end had a small piece of stick bound on by sinew at an acute angle, through a hole in the throwing stick. This stick ended in a knob to which the notch on the spear was fitted. The throwing stick was often used as a weapon of offence.

The shield was known to the Wakooras, but they made very little use of it. Their weapon of defence was a throwing stick, and they could almost invariably glance the spear in flight, breaking the softwood part. They had no wooden sword, and their weapons were not carved or inlaid with shell of any kind.

These tribes were warlike and were often fighting among themselves and with neighbouring tribes. About 1893 a tribe of Mitchell River natives known as the Kooka-minnies raided the Hodgkinson Valley. The combined Wakoora, Chunkunberry, and Wun-yurika tribes were outnumbered and stood no chance against the invaders. The Kooka-minnies took all the young women and the men were driven away. An interesting point is that the Kooka-minnies captured a Chinese garden belonging to a man called Min Fu and divided it up amongst themselves, giving a certain amount of garden to each person. The whites of Woodville, numbering about twenty, attacked them at night and dispersed them with rifles. The local natives on their return found their gins in the camps vacated by the Kooka-minnies, many of them tied up.

When the men fought they were always armed with spears, unless it was the outcome of a sudden quarrel, when the nearest weapon would be used. Fights were often arranged days before they eventuated. When this was the case the fight was preceded by a great amount of talking, spitting, swearing, and other display. This was often as far as it got; but if affairs ended in a fight they would separate about 50 yds. and throw spears at each other. Usually no damage resulted, spears being parried with the throwing stick.

When the men were fighting, there would always be several old gins dancing, with constant singing and swearing, around and between the combatants, carrying the yam-sticks which they invariably had with them. The gins were never hurt, though it is hard to understand how they escaped injury.

The gins often fought savagely among themselves, and their method was this: They would stand apart, armed with their yam-sticks (a wooden club about 4 ft. long and $1\frac{1}{2}$ in. wide, and with blunt-pointed ends), spitting and swearing at each other, biting the yam-stick and hitting it on the ground. They would gradually close on each other and put up a battle reminiscent of the quarter-staff bouts of "Ivanhoe." Although the gins were pugnacious among themselves and often fought more savagely than the bucks, they allowed their husbands to beat them without opposition.

Arts.—Painting and the arts in general were practically non-existent. The only drawings I have seen wrought by these natives were crude pictures of goannas. They were fond of making the tracks of birds and animals in the soft sand. At the present time, the natives have acquired some skill in carving and painting, but this is a modern innovation.

Puberty.—Amongst the girls puberty had no tribal significance beyond that they then became marriageable. Amongst the boys, sometimes before puberty, the penis was tied backwards over a roll of tea-tree bark. The effect of this was to give the organ a distinct bend downwards. While

undergoing this process the boys were very self-conscious and shy. We might note here that masturbation was exceedingly common among both men and women. At puberty the ceremonies were—

(*a*) Knocking out the upper right central incisor.

(*b*) Piercing the septum-nasi.

(*c*) For boys only—drinking of some of his father's blood; or if the father were dead the blood of the nearest male relative. The boys were thereby fitted to grow into strong men.

(*d*) Among the girls the hymen was ruptured with the finger.

Devils, Doctors, and Burials.—These natives were highly superstitious and had an intense fear of devils. There were four of these—

(1) The Beerroo, who lived anywhere.

(2) The Eekoo (or mountain devil), who lived on Mount Mulligan.

(3, 4) Mooramully, Barmboo—Water devils inhabiting waterholes.

Most sickness was attributed to the agency of these devils, the blame generally falling on the Beerroo or the Eekoo. These devils were able to throw hooks, stones, or pieces of wood into the body without leaving a mark. The Eekoo's home was a lake on Mount Mulligan (Lake Koongirra), and natives were very afraid to go near this lake or into its waters; though the Rhoonyoo (or witch doctor), being a companion of the Eekoo, could enter the water without fear. The Eekoo was generally held responsible for any sickness when on the mountain. The natives have an interesting legend to account for the origin of Mount Mulligan and its lake. The mountain, which was built by the wallabies on the advice of the eaglehawk, was originally a huge pile of stones. A swamp pheasant built its nest on the mountain and hatched its young. The Eekoo came along and killed the nestlings. The pheasants in their anger thereupon started a bush fire to burn the Eekoo, and so great was this conflagration that it melted the stones and so formed the towering cliffs of Mount Mulligan. To save his life the Eekoo created the lake and took refuge in its waters; and so the lake became his home. Although the lake is the home of the Eekoo, strictly speaking he is not a water devil but wanders about anywhere on the mountain. Some of the old natives declare that they saw the Eekoo sitting on trees around the mine a few days before the great Mount Mulligan colliery explosion in 1921. They say he blew up the mine in anger at the white man's intrusion on his domain. They firmly believe that he will again blow up the mine.

The Mooramully and Barmboo lived in the waterholes, and were responsible for deaths by drowning or sickness coming on shortly after a swim. All these natives were excellent swimmers. If a native were caught in quicksands he declared that the Mooramully had pulled him under. The booming noise made by ripples against a washed-out bank was the voice of

the Barmboo. The Mooramully was an important spirit, since he not only initiated the Rhoonyoo or witch doctor, but also kept him supplied with knowledge and worked for him. When the rainbow came out, this was the Barmboo himself. If it shone on a native (other than the Rhoonyoo) he would die.

It was a common occurrence for either the Beerroo or the Eekoo to carry off a gin or a man and deal with them as previously described. The natives used to mark trees and hang up pieces of bone to frighten these two devils away. The devil was supposed to see these and depart satisfied.

Superstitions.—They had many superstitions about animals and birds. If a swamp pheasant flew near them they feared their hair and whiskers would grow long. The wagtail was the Beerroo himself; they did not like this friendly little bird to come near them. The channel-bill was supposed to make the penis grow long and, to use a simile, like that of a horse, and the vagina capacious. I have keen recollections of small aborigines thirty years ago quickly covering their persons when the scream of this bird was heard. The dollar bird was the controller of the mussels, shifting them from place to place in the river. He did this work in the night. The bat was responsible for all grey hairs. The shaky-paw lizard was not to be held up by the tail. This would cause the heavens to fall. The bush cockroach was supposed to squirt urine into the eyes and cause total blindness, and death shortly after. Kangaroos suffered a great deal from this insect. The jacky-winter bird controlled the sun, and was responsible for hot days.

Witch Doctors.—Each tribe had its witch doctor or Rhoonyoo, who was the most important man in the tribe. He was generally the most cunning and strongest man of the tribe, since he appointed himself. On the death of the Rhoonyoo, the most cunning man of the tribe would go away for a day or two and on his return say that he had been made Rhoonyoo by the Mooramully. He declared that he was carried off by the Mooramully to his favourite waterhole and lived with the Mooramully in sodomy for some days. The Mooramully then killed the prospective Rhoonyoo by sticking long, thin, sharp pieces of wood through his body. The Mooramully then restored the candidate to life by pulling the pieces out of his eye. The candidate, on his return to life, put the Mooramully through the same performance, and was fully qualified. He then returned to his tribe and was acclaimed Rhoonyoo, which means "thunder." His functions were to cure diseases and control the weather. He cured diseases in the usual way by removing the hooks, sticks, or stones thrown into the patient by the devils. This sleight of hand work was done very cleverly. He also frequently treated disease by bleeding. He could bring the wind and rain at will. His failures were always excused by saying that several Rhoonyoos of other tribes had conspired against him, and their combined efforts were more than he could combat. The natives were afraid of the Rhoonyoo, as he could sing them

dead, send poison by the wind, or cause them to shrivel up and die. In fact he could kill them by any method he pleased. The members of the tribe had to supply him with food. Although powerful he was not chief of the tribe. This function was performed by the best fighter. Any member of the tribe was supposed to have the power to sing another person dead. Deaths in the tribe were often attributed to members of other tribes hundreds of miles away. Bone or stick pointing was not practised by this tribe.

The Rhoonyoo often displays great imagination in his stories. One Rhoonyoo declared that there were big bark tanks in the heavens which he kept filled, and from which the rain fell. The dry weather was caused by a big bull that lived on antbed and thus got very thirsty. This bull by drinking up the water supply caused a drought. This is a modern tale told to me by Chower-ee-pa, the present Wakoora Rhoonyoo.

Singing.—They were energetic and frequent but not tuneful singers. Many of their songs were impromptu, especially the corroboree songs. Some were standardised and well known. Of these standardised songs, some had meanings—e.g., about trees, love, &c.—and some were a meaningless jumble of sound. The Rhoonyoo had special songs to bring rain and wind; the gins had theirs to drive it away. A mournful dirge was kept up for days when a death occurred, and also at the unexpected arrival of a near relative after a long absence.

Burials.—After a death all the gins would wail for days, and some of the older gins would roll their hair into little balls with wax; the camp was always shifted. The dead were either mummified or buried. The mummification was done by rolling the body full length in tea-tree bark and binding tightly with string. This was left in the sun and carried from camp to camp, sometimes for years. Very few bodies were treated in this manner, the majority being buried. They had no fixed burial ground; each corpse was buried in a different spot, and well away from the others. As soon as death took place, the naked body without ornaments was tied up with string made from the pandanus tree. The knees were pressed well into the chest, elbows by the sides, and the hands extended along the cheeks. The body was tightly wrapped in tea-tree bark, and buried about 4 ft. deep. The body was placed in the grave on its left side facing the west. A fire was also lit on the west side, in the belief that the devil, on emerging from the grave, would be burnt in the flames.

The natives never referred to a member of the tribe after his death. The mention of a dead person would often make the gins cry.

Language.

The language is simple in the extreme. The vocabulary comprises about 800 words. Great irregularity marks their grammar and syntax. The same

word acts as noun, verb, adjective, &c., without alteration; and there are no tenses, cases, &c., or any inflections. About the only rules of syntax are that a pronoun or noun generally begins a sentence, and a verb ends it; and adjectives follow the nouns they qualify. Reduplication was used very freely, for emphasis. A suffix "-jee" is often added to words, but has no meaning. Words are often clipped short in speaking—e.g., "bunna nooka" for "bunna nukarnga," "poopair" for "poopeelungun."

Vocabulary.—The following words comprise almost the whole vocabulary. Words are written as pronounced. The composite guttural sound of "n" and "g" is printed in italics; where "ng" is printed in ordinary type it is pronounced as two letters:—

Kúrr*n*gun = Hard
Pútchee = Sore; also a hole in a tree
Chóoma = By-and-by
Bútta = Down
Góorin-góorin = Crooked
Chárrpa = Boggy
Binna-kúrrajee = Deaf
Minnee = Good
Chányee = Bad
Kúlmba = Sweet
Winkúrrajee = Hungry
Wówoo = Thirsty
Kúlparlee = Long or big
Kápoo = Stinking
Dincha-mutchun, Dár*n*goo-galláh = Bald-headed
Nyóopun = One
Múmmarra = Two
Kóorchoo = Three
Yálla = Close
Kóolee = Angry; or a louse or flea
Kúmba, Kúrrpar = White
*Ng*óompun-*ng*óompun = Black
Bi*ng*arjee = Grey
Kóotchee, Marróon = Red
Yámma-dámma-doo, Yámma-doo = Up, or the sky
Kóonk-arr = North
Núcka = East
Kóoa = West
Chérparr = South
Chóomoo = Short
Bóoya = To pass flatus
Wanchámba = Where
Yálla, Yárra = There or here
Yállanya = This or that
Kármpoor, Búnkar = Raw
Wápparlee = Four
*Ng*ármootchee = Plenty (above four)
Chappa-chappa, Chár*n*goorr, Kúlparlee = Big
Póopeelungun, Poopin = Little
Wóolair, Wóolun = Dead
Chílpa = Very fast
Chéerily = Very hairy
Kútchaga = With great exertion
Dúmma-dúmma = To go in and out
Núnka-núnka = Early in the morning
Wóorrmpa = (To sleep) soundly
Chóomoo = Short
Párnpardee = To cry
Chúnkee, Mullbíndamulla = To climb
Wándeela = To pick up, get up, lift
Muncénee = To bring
*Ny*ama-*ny*árna = To understand
Wachóojoo = To burn
Wóonchoo-wachóojoo = To make a fire
Búnna nookárnga = To drink
Noo-kárnga = To eat
Kútta = Come
Umba = Come on
Tóo*n*gun = To go
Móokarr = To cut marks
Múnkun-múnkajee, Múnka-múnka = To play
Bóotcha = To repeat
Kóonchoo = To bend a joint of the body
Móonka-*ny*úntarnda = To cut hair
Kingkínakin, Chóonchoolee = To pretend
Párrpan-párrpan, Káoo-káoo = Yellow
Yállmarr, Nagóoroo = Blue
*Ng*éikooloo = Green
Yoikói, Yóorra, Yúkka = Look here! an exclamation to call attention
Woi = Hullo! in answer to a call
Bíndarlee = Sweating freely
Yínkarn = Very thin
Bóolka = Hurrah
Muh = Interjection indicating surprise and satisfaction
Yukkóoey = Interjection indicating satisfaction
Owa = Tommyrot (interjection)
Wandíndy = To stand

Múnka = To laugh
Kúngya = To dig
*Ny*únta = To cover up
Charrkúnda = To run
Kúrra = To dive
Mírrinjee, Mírree = To break
Tóongada = To walk
Netchéenjee = To see
Wóomee = To smell
Chárrpee = To swim
Nyóompoo = To spit
Bóorka-bóorka = Venereal disease
Yálkaga = To sing
Poondúnda = To stop
Bulkárga = To say
Pútchee-wandíndy = To develop a sore
Wattárda = To swear
Itcharing = To put or place
Wóonana = To sleep
Wállancha, Wállanchalla = To throw
Bóoimunjee, Bóoimair = To hit or to fight
Muneenee = To bring
Kúll*nga* = Uncle
*Ng*útchee = Grandfather
Kúmmee = Grandmother
Bímmair = Aunt
*Ng*únchun = Father
*Ng*ármoo = Mother
Púpparr = Sister
*Ng*óochoor = Cousin
Yáppa = Brother
Yáppa-choo = Young brother
Bóogoojee = Old man
Wárroo = Young man
Méekooloo = White man
Kárkoo = Baby
Chámpeer = Child
Dútcharr = Boy
Gírra = Girl
Kúngamulka = River
Bóotchee = Plain or flat country
Bármboo = Rainbow or water-devil or earth-worm
Chápoo = Dust
Kúppee = Urine
Chátcha, Chambútchee = Fæces
Bóorrkair = Semen
Chíloo = Sweat
Márnoo = Throat
Búnna-charkúnda = Running stream
Wóonchoo = Fire
Wóonchoo-kóonkin = Firestick
Bíkarnga = To bite
Nookárnga = To eat
Dínkarnga = To catch hold of
Márnoo-dóo*nga*-dóo*nga*, Kúlchin-kulchy = To vomit
Yámpa = Hut, home, or camp
Kúbba-kúbba = Corroboree
Kóorrma = Native oven
Myee = Food
Wápparr = Shade
Kóol*ng*arr = Dilly-bag (woman's)
*Ngóony*in = Dilly-bag (man's)
Klápam = Tea-tree bark torch
Pítchee = Tail
Kóonkun = Club
Yárrmoo = Yam-stick
Yirrimba = Fish-spear
Kucka = Sick, or tobacco
Kúlka = Spear
Móorunga, Bútcha-bóokal = Long war-spear
Koóeeyun = Quartz-spear
Rúmun = Throwing stick
Wú*ng*ee = Boomerang
Wárrpee = Tomahawk
Yóomparrajee = Stone tomahawk
Kúlmba = Honey or small native bees' nest
Móorungun = Large native bees' nest
Wóonpa = English bees' nest
*Ng*óokoo = Bees' wax
Yeéparr = Sinews
Kúrrkair = Water vessel
Wóonga-wandíndy = Morning
Eélei-élee = Evening
Pítchoor = Dark
Mú*ng*y-mú*ng*y = Day
Wápparr = Shade
Múrra = Hand
Dár*ng*oo = Head
Méeralee = Eye
Dírra = Teeth
Márnoo = Throat
Chíppa = Liver
Boónoo = Buttocks
Yínkun = Pectoral muscle in front of axilla
Dútcharlee = Heart
Chóorpoo = Bowels
Chóolpee = Small intestine
Boórroo = Belly
Núnchun = Collar-bone
Boórroojee, Kárkoonjee = Pregnant
Moónkoo-charkúnda = Abortion
Chátcha-boórrpoor = Diarrhœa
Chímar = Antbed
Kílmary = Ashes
Wóorpa = Fog
*Ny*ínchar = Sound

Mínya = Meat
Búnna-bóoleen = Waterfall
Ch ll*ng*arr = Shell ornaments
Dúnkee = Gully
Bóonchooroo = Swelling in skin
Bárchoo, Kóonkin = Stick
*Ny*óompoo = Saliva
Boónkoo = Knee
Móorrmoon = Maggot
Waárring = Husband
Galláh = Circumcision
Meémee = Breasts
Bóorroo = Abdomen
*Ny*ápee = Tongue
Wállarr = Beard
Bínna = Ear
Chówa, Kár*ng*koo = Mouth
Móo*ng*ka = Hair
Máppoo, Kílmpee = Womb
Chíppee = Vagina
Chírry = Pubic hair
Kóornkoo = Hymen
Chóonkoon = Labia vulvæ
Chárra, Boókoo = Penis
Dóonkoon, Tarlan = Glans penis
Koóra = Testes
Choombármpa, Choombúnka = Coitus
Mírry-dúmma-dúmma = Masturbation
Toómbarinka = To take away virginity
Chóolma = Sand
Wányoor*ín*gada = What are you doing? or why?
Jírry = Clouds
Yeérpee = Whistle
Yeékoorr = Spring of water
Mákirra = White clay
Yóolmpoo = Big mountain
Bóotcheer = Big patch of sand
Yímpee = Lips
Chátta = Thigh
Kúpparee = Armpit
Dóompoo = Boots
Kúllman = Sexual maniac
Wárloo = Face
Póopair-yoópar, Kúppeer-kúppeer, Yárrka-yárrka = Lot of little children together
Kúrra = Sound like a whip cracking
Móonyoolee = Running nose or cold in the head
Déewun = Scrub turkey
Wóormboo = Plain turkey
Chóonking = Flying fox
Kóoladoo = Dove
Wárrkoongoo = Dollar bird (roller)
Kátchirry = Grey jumper
Jarkooer = Leatherhead (friar-bird)
*Ngárng*koo-*ngárng*koo = Twelve apostles (babbler)
Chóoreear = Bower-bird
Chíllchoor = Fish eagle
Chínna-pítchoo, Chínna-márlkoo = Sparrow-hawk (goshawk)
Yálpun = Stormbird (channel-bill)
Kulmbú*ng*arr = Shag
Pírr-pírr = Blue Mountain lorrikeet
Míllee = Bat
Kóoyoo-bugga = Gigantic crane
Búngarr = Blue crane
Chéewoorba = Swamp pheasant
Réwa = Duck in general
Kóotantoo = Rosella parrot
Míllun-millun = Tree-creeper
Jeérfeer = Large honey-eater
Koótchoorlee-bírry-bírry = Bee-bird
*Ng*úrrkee = Night-owl
Múrrar = Feathers
Míttee = Leech or tick
Mooya-moo = Ant
Tow-w = Sound of rifle shot
Wair = Exclamation meaning "I don't know"
Chílloor = Wild goose
Túpparr = Squatter pigeon
Lármpa-larmpa = Bronzewing pigeon
Kookóocheedee = Wampu pigeon
Wakóoka = Jackass
Bóornkin = Black cockatoo
Géeaja = White cockatoo
Pyee-pyee = Magpie
Ditteritchen = Wagtail
Dóonoree = Wedgetail eaglehawk
Boórkoor = Kite
Kuránjee, Bányan = Emu
Kóorchar = Native companion
Tú*ng*arr = Ibis
Wátchar = Crow
Billawarra = Pelican
Tár*ng*oon = Bird in general
*Ng*óorkoo = Mopoke
*Ng*illy-*ng*illy = Black duck
Chee-wiggey = Whistling duck
Dúrrnchar = Egg
*Ny*óorpoo = Butcher-bird
Wóonga = Jacky-winter
Móonya = Honey-eater
Kúmmair = Fly
Pítchin, Chímoo = Grasshopper
Bitchin = March fly
Kóorain, Chámpoon, Koóloongoor = Large tree-grub.

Móokotóomboo = Water spider
Pítchee-cúmparrjee, Bíttoon = Ringtailed 'possum
Wóoroo-rhóomboo = Black snake
Múllkúnneymoo = Brown snake
Tóopa = Death adder
Yeékurr*ang*un = Black prickly-backed water-snake
Réwa wungíriga = Freshwater crocodile
Múnkair = Frill lizard
Bóolmbaroo, Bóolcha-bóotcha, *Ng*óclamagoo = Sleepy lizard
Choolmbárnoo = Large plain kangaroo
Wárrajee = Wallaroo
Kúntama = Pretty-face wallaby
Bówoor = Rock wallaby
Wálkooree = Kangaroo rat
Chálln*g*ar = Bushtail rat
Wyka = Native cat
*Ngúng*kin = Porcupine
Toórka = Bandicoot
Toómpoo-tóompoo = Stag beetle
*Ng*ástilalum = Green water-snake
Kulpówoorr = Cypress pine
Myra-myra = Ironwood tree
Mútchula = Branch of tree
Qúinkun = River fig-tree
Chátama = Rough-leaved fig-tree
Chálln*g*arr-chátchoor = Pandanus tree
Rúngoon = Pandanus fruit
Koópoorr-kóopoorr = Quinine tree
Boóncha-booncha = Mosquito
Moolóoachar = Ant-lion
Woónchurúngun = Bush cockroach
Káiya = Sand cricket
Yów-wa = 'Possum
Chálpun = Carpet snake
Yínboonboo = Black water-snake
Búrrcharjee = Tarpot (black-headed python)
Dickarr = Snake in general
Woórnka = Goanna
Chúnkalunkun = Shaky-paw lizard
Kiya = Dog
Woonbóongoo = Water-rat
Bóoree = Track of foot
Jóolabirry = Whip-snake
*Ng*átchalum = Blind snake
Kínyeegar = Bandy-bandy snake
Wóowarl, Chárrpar = Green water-snake
Bóorpoor = Lance-headed lizard
Móorum = Dingo
Chóorree-chóorree = Yellow water-goanna
Bóorama = Black water-goanna
Chámba = Turtle
Dárree, Tálnkarr = Box-tree
Kárngooparbal = Leichhardt tree
*Ng*óoyoolee = Burdekin plum
Bírrar = Leaves of bushes
Károola, Wárraboolka = Large bitter yam
Wámmoon = Long thin yam
Múnnarr = Currajong
Kóora-ace = Currajong fruit
Kówarr = Bloodwood, or to shout out
Kárrboo = Ebony tree
Pílchirry = Tree, growing in watercourses, which has long thin upright branches
Queéka = White currant growing in rivers
Bóokun = Grass in general
Bányan-bányan = Wild peach-tree
Dítchin = Dead bark of ironbark
Yéela-yéela = Wild hops
Dutchárnjee = Wild grape
Tálmanjee = Wild pomegranate
Chárrkun = Gum-tree resembling ironbark
Wárlchoo, Chárakun = River gum-tree
Yáy-yam = Catfish
Wáttar = Black bream
Dárlkoo = Archer (spotted bream)
Kóorkin = Guard-fish
Woolpérr*ang*un = Rock cod
Woókajoo = Large shrimp
*Ng*árrankuljee = Finger-mark fish
Bínyee = Periwinkle
Jínna = Foot
Kárrkoon = Blood
Wúngalungun = Fat
Kítcha = Moon
Yírrmbee = Light
Wóolpun = Heat
Bóora = Ground
Koópoor, Boórair, *Ng*ároo = Smoke
Málmair = Lightning
Kóoyun = Hail
Kóonkin = Wood
Yeéga = Yes
Bárloo = I won't
Rúkka = Tree for poisoning fish
Yállnkarr = Wattle
Pórla = Firefly
Wállabooroo, Wárrka = Cork-tree
Noórka = Ironbark wood
Kóoragun = Ironbark tree
Múrraba = Broad-leaf tea-tree
Doórncha = Grass-tree
Chíchoo = Narrow-leaf tea-tree
Bóykoo = River tea-tree
Kooyoo = Fish
Muníaka = Small jewfish
Chúnkun = Large jew

Pínyoor = Perch
Kárrojee = Bony bream
Boólcha = Mud cod
Koóndy = Mussel
Woólerajin = Leather-jacket
Woómoo = Nose
Dárree = Bone
Yárlpun = Skin
Woónga = Sun
Mútta = Star
Wákaree = Cold
*Ng*oókoo = Water
Chúnka = Stone
Quí*nga* = Wind
Rhóonyoo = Thunder
Búnna = Rain
Múncha = Hill, or appetite satiated
Beéroo = Devil
Kúrree = No
*Ng*eíkoo = Me
*Ng*eíyoo = I
Yóontoo = You
Níckoo = To-day
Mímmee = Milk
Boó*ng*arr = Flowers
Chá*ng*ar, Dáincha = Dry
Kúckajee = Sickness
Kárkoo, Moóroon = Fingers or toes
*Ng*árra or *Ng*áree = Back of hand
Moótchun = Wrist
Choóroo = elbow
Yíncarn = Rib
Beépa = Leg (ankle to knee)
Woóloo = Ankle
Doónkoo = Back of neck
Toómoo = Lung
Goómpoo = Bladder
Bínna-too*ng*un = To forget
Día = To give
Chínken-chínkarjee = To play about
Wóokalooka = Liar
*Ng*árlee = Us
Kúnparrgo = Yesterday, or past time
Chóoma = Future time
Núnkarrba = To-morrow
Múnyarra = Wife
Choówun = Flood water
Cheérpun = Wet
*Ng*árkoo = Palm of hand
*Ng*ármoo = Thumb or big toe
Chícker = Elbow to wrist
Bínta = Shoulder to elbow
Moórrey-móorrey = To tickle
Chátta = Thigh
Boónkoo = Knee
Woórpar, Boórrkoin = Brain
Chákar = Shoulder
Wooóra = Kidney
Meélkoor = Finger-nails
Kóolperra *ng*únda, Kóolparnda = Well done!

The following are a few names of natives :—

MEN.

Choweryeepa
*Ng*armoo-gooly-gooly
Chooragoorum
Mooyamoo
*Ng*armoo-yeeranda

(These were all "Rhoonyoos" or witch doctors. The word "*Ng*armoo" at the beginning of a name means that the person is the son or daughter of the person who held the latter end of the name, "ngarmoo" meaning "mother.")

Wowmitchoo
Marrkoo
*Ng*armoo-kooboora
*Ng*armoo-bupoon
*Ng*armoo-goonyooree
Munga

(Munga was king of the Wakooras when the whites first came to the Hodgkinson.)

*Ng*armoo-yooboonboo
Opee

WOMEN.

Chinna-goorin ("crooked-foot")
Chamba-chambutchee ("turtle-dropping")
Kootchoorlee
*Ng*armoo-tarpengoon
Munga-charnyee ("mouth-wounded")
Katcha
Warr*ng*unda

Sentences.—The following are a few sentences strung together as the natives would say them :—

Yoontoo wunyooringada woke-arrambarmba = What the devil are you doing ?

Yoontoo wanchamba toongun = Where are you going ?
(you) (where) (go)

Yoikoi ! Rhoonyoojee ! Yoontoo nunkurraba bunna-wallncha ?
(hello) (doctor) (you) (to-morrow) (rain) (throw)

Hello, doctor, will you make rain to-morrow ?

Booliman kutta ngarlee booimunjee chilpa charkunda.
(policeman) (come) (us) (hit) (very fast) (run)

The policeman is coming to hit (or shoot) us ; run quickly.

Bumma warnchoo yoontoo booimair ? = Who hit you ?
(man) (which) (you) (hit)

Ngeiyoo warloo kurree necheenjee = I don't know who he was.
(I) (face) (no) (see)

or the word " Waar " expresses exactly this meaning.

Yoontoo karnparrgo pitchoor-pitchoor malmair necheenjee ?
(you) (yesterday) (dark) (lightning) (see)

Did you see the lightning last night ?

Choweryeepa Chillagoe toongun—Choweryeepa has gone to Chillagoe.

Wanyooringada yoontoo kumkum nukarnga ?—Why are you drinking beer ?
(why) (you) (beer) (drink)

Chanyee ngeikoo papparr woolair—I am sad because my sister died.
(no good) (me) (sister) (dead)

Local Names—

Mulligan Creek—Mutchelum.

Pinnacle south of Mitcheemitcheewarry—Boonboonchoorkoorgoo.

McLeod Creek—Mooncharjee.

Eastern Hodgkinson River—Choolkoor.

Union Waterhole—Chookoochookoo.

Waterhole below the Union Waterhole—Yoolboonboo.

Condle's Waterhole—Ngarmoo-chinkunda.

Darkie Green's Waterhole—Jimbajimba.

Walsh's Crossing—Chillagurra.

Junction of the two Hodgkinsons—Jararngurra.

Waterhole near " Piggies "—Rootchoonagoo.

" Piggies " Waterhole—Wowmurrakunda.

Old Kurramoor Station Waterhole—Champingago.

Waterhole at the junction of Waterford Creek and the Hodgkinson—Wooweewooweelarjago

Chinaman's Waterhole—Putcheerchootoo.
Mountain Waterhole—Meerkooroo.
Lily Waterhole—Bootcheerraga.
Yard Waterhole at south end of Mount Mulligan—Chincham.
Mulligan Creek Falls—Ditcharna.
Black Mountains at Deep Creek—Yoompoortookoor.
Pinnacle at Burrankamen—Warra.
Pride of the North Waterhole—Chilungarrba.
Waterhole above the Pride of the North—Burrankamen.
Black Mountain—Boondarimba.
Mount McCann—Kookaman.
Two-headed Pinnacle South-west of Black Mountain—Bannita.
Three Sisters Mountain—Wallanjirry.
Hodgkinson River—Kulkinnen.
Mitchell River—Dimbee.

Neighbouring Tribes.—The following are the names by which the surrounding tribes were known to the Wakooras :—

Chillagoe—Warkaman.
Mareeba—Moorlooratchee.
Irvinebank—Choolngai.
Palmer River—Kookawarra.
Mossman—*Ng*arlkajee.
Dimbulah—Woombarmbarra.
Normanton—Kookaminnies.

NEW RECORDS OF CETACEA,

WITH A LIST OF QUEENSLAND SPECIES.

By Heber A. Longman, Director.

(Plate XLIII.)

PYGMY SPERM WHALE: Kogia breviceps (de Blainville).

In December, 1925, Mr. W. K. Cleeve, Secretary of the Rockhampton School of Arts, forwarded small photographs of a skull, which had been presented to the Museum in his charge. Recognising this as the rare *Kogia*, or pygmy sperm whale, I wrote asking if the skull itself could be sent in order that the specimen might be placed on record. Subsequently it was forwarded to Brisbane, on loan, for exact identification and description.

The skull was found under sandstone cliffs about five miles north of Corio Head, or approximately twenty miles north of Yeppoon, by Mr. George Corbett, who presented it to the Rockhampton School of Arts Museum. Unfortunately the material consists solely of the skull, which has evidently been exposed to the weather for a lengthy period and is much damaged and abraded. The anterior portion of the rostrum is incomplete. The lamelliform extensions of the maxillæ overlying the orbital region are broken away on each side, exposing the surface of the frontals. The vertex is incomplete, owing to abrasion, and the anterior portion of the mid-facial crest is now missing. The vomer is also damaged anteriorly. The orbital and palatal surfaces are much abraded, and no periotic bones are present. Notwithstanding the unsatisfactory condition of the skull, it has been thought advisable to put a few notes on record, but the specimen does not lend itself to significant illustration or detailed description. It is the first record of this rare Cetacean from the Queensland Coast.

No less than six species of the pygmy sperm whales have been described, three coming from Australasian waters. Under the name of *Euphysetes grayii* Wall, in 1851,[1] published a description of a skeleton found on Marouba Beach, Sydney, although the work is said to have been done by Macleay. In 1865 Krefft described *E. macleayii*, which was based on a specimen from Manly Beach,[2] and in 1873 Haast described *E. pottsii* from Governor's Bay, New Zealand.[3] Although considerable variation is presented by the crania and

[1] W. S. Wall, Memoir No. 1, Australian Museum, Sydney, 1851.

[2] G. Krefft, Proc. Zool. Soc., 1865, p. 708.

[3] J. Haast, Proc. Zool. Soc., 1874, p. 260, and Trans. Pr. N.Z. Inst., vi., 1874, p. 97, pl. xv.

skeletal remains on which these species are based, the majority of systematists consider that there is but one wide-ranging species, *Kogia breviceps*, first described by de Blainville in 1838 as *Physeter breviceps*, the type locality being the Cape of Good Hope.[4]

Oliver notes that twelve examples have been found on New Zealand coasts,[5] and Lord and Scott note a mandible in the Tasmanian Museum.[6]

This incomplete Queensland skull has a maximum length of 395 mm.; the maximum breadth is 410 mm. (between the postorbital processes); and the height is 260 mm. (pterygoid margins to vertex). In the supraoccipital region there is a pronounced median concavity. From the posterior aspect it agrees fairly well with the cranium of *Kogia breviceps* as figured by van Beneden and Gervais (Plate XX., fig. 1*b*),[7] but the region of the vertex is more elevated. In this respect our cranium agrees with the specimens previously described from Australia and differs from the more flattened skull from Japan called *Physeter simus* by Owen,[8] which Beddard regards as a good species.[9] The zygomatic processes are plainly visible beyond the exoccipitals on each side, from this aspect.

The mid-facial crest is formed, as usual, by the thickened posterior portion of the left maxilla, conjoined with the posterior extension of the right premaxilla. The last bone extends for almost the total length of the skull and apparently reaches in this Cetacean the relative maximum antero-posterior extent for the mammalia, illustrating to a remarkable degree the plasticity of the rostral elements.

It is true that in the Sirenia the massive premaxillæ of the dugong (containing extraordinary elongated incisors that are almost wholly hidden in most specimens) present an analogous development, but even here the anterior elements, although the dominant bones, do not extend so far back towards the occiput. In the perfect specimen of *K. breviceps* described by Benham, "triangular calcifications" carrying a tooth were noted at the tip of each premaxilla.[10]

There is no evidence of the frontals on the surface in the region of the vertex, and there are no distinguishable nasals. The left blow-hole, or external narial orifice, is oval, with the antero-posterior diameter 60 mm., and the transverse 40. The right orifice is almost circular and is relatively insignificant, being only 15 mm. in diameter.

[4] de Blainville, Ann. Anat. Phys., ii., 1838, p. 337.

[5] W. R. B. Oliver, New Zeal. Jr. Sci. Tech., v., 1922.

[6] Lord and Scott, Syn. Vert. Animals, Tasmania, 1924, p. 280.

[7] van Beneden and P. Gervais, Ostéog. des Cétacés, 1868-1879.

[8] Owen, Trans. Zool. Soc., vi., 1869, p. 30.

[9] Beddard, A Book of Whales, 1900, p. 189.

[10] W. B. Benham, Proc. Zool. Soc., 1902, p. 55.

The basal view of the skull is too much abraded to yield much information for comparative value with other specimens. Although incomplete, the lower borders of the pterygoids are obviously inflected posterior to the tubal notches, as in the specimen described by Schulte (p. 374), in his valuable study of fœtal and adult skulls.[11]

Beddard notes (*loc. cit.*, p. 186) that "Kogia or Cogia, as it is variously spelt, is a 'barbarous' word said to be a Latinised form of 'codger.' But it might be a tribute to a Turk of the past named Cogia Effendi, who observed whales in the Mediterranean."

BEAKED WHALE: Mesoplodon densirostris (de Blainville).

A skull of this rare Cetacean was found at Yeppoon, near Rockhampton, and presented to the Queensland Museum by Dr. E. H. Beaman in March, 1924 (J. 4056). No mandibular remains were secured, and unfortunately the skull is somewhat damaged and abraded. This is the first record of this species for Queensland. The maximum length of our specimen is 720 mm. At a distance of 250 mm. from the tip of the rostrum, which is not quite complete, the height of the combined elements, which are well ankylosed, is 76 mm., whereas the width in this region is but 51 mm. Near to the anterior projection of the palatine bones, 50 mm. behind the previous region, the rostral is still more compressed laterally, but towards the apex the diameters are about equal. This gives concisely the chief characteristics of the massive rostrum. At the posterior end the mesorostral ossification rises above the premaxillaries in the median line. In front of the maxillary foramina the two deep characteristic grooves are present. Unfortunately the orbital region on each side is much damaged, and the ventral surface is considerably abraded. In general contours our specimen agrees well with the very fine illustrations of this species recently published by Sir Sidney Harmer, with detailed descriptions and references to literature.[12]

Amongst other characters, *M. densirostris* is distinguished from a New Zealand species *M. bowdoini* Andrews,[13] which also has a very thick rostrum, by the absence of deep inner notches and the more posterior position of the antorbital notches at the base of the rostrum, the composition of the elements of the vertex, the narrower ventral surfaces of the pterygoids, and the curved lateral expansion of the rostrum in its central region, as seen from either dorsal or ventral views.

Krefft has recorded *M. densirostris* ("Dioplodon sechellensis") from Lord Howe Island,[14] and this appears to be the only specimen previously noted from Australasian waters. According to Sir Sidney Harmer (*loc. cit.*, p. 576) only

[11] H. V. W. Schulte, Bull. Amer. Mus. Nat. Hist., xxvii., 1917.
[12] S. F. Harmer, Proc. Zool. Soc., 1924, pp. 541-587, pl. i.-iv.
[13] Roy C. Andrews, Bull. Amer. Mus. Nat. Hist., xxiv., 1908, pp. 203-215, pl. xiii.
[14] G. Krefft, Proc. Zool. Soc., 1870, p. 426.

seven examples were known in 1924 of this rare species. An illustration of the body contours, as drawn from nature, was published by R. C. Andrews in 1914.

A NEW BEAKED WHALE: **Mesoplodon pacificus** new species.

(Plate XLIII.)

An unusually large skull and mandible of a Beaked Whale found at Mackay in 1882 were presented to the Queensland Museum by Mr. E. W. Rawson. This material (J. 2106) represents a new species of *Mesoplodon* with a single pair of apical mandibular teeth, but which can be readily distinguished from both *M. hectori* and *mirus*. In several respects it resembles *M. mirus*, established by True in 1913,[15,16] more fully described and illustrated by Harmer in 1924,[17] and which is only known from three specimens obtained from the Atlantic.

The skull is nearly four feet in length, and judging from its size and the condition of the sutures it represents a fully mature whale. The specimen is in fairly good condition, but is somewhat abraded in places owing to exposure.

The chief characters of the new species are as follows:—A single pair of apical mandibular teeth; symphysis more than one-fourth of the mandibular length. No basirostral groove; rostrum very elongated, shallow, margined with a prominent flange. Maxillary ridges prominent and not diverging outwards. Maxillary foramina much enlarged. No inner notches present in antorbital region. Lachrymal very strongly developed and forming the chief lateral constituent of the antorbital tubercle. Region of vertex contracted towards the occipital elements, which are almost vertical; transverse diameter behind premaxillæ much exceeding antero-posterior length of vertex; nasals confined to anterior moiety of vertex.

Mandible.—With the exception of the postero-inferior margins the mandible is perfect (Plate XLIII., fig. 3). No teeth are preserved, but there are two large alveoli at the apex of the jaw. These alveoli are 28 mm. in antero-posterior extent, with a width of 17 mm., and they are directed forward. The extreme tip of the mandible, just beyond the alveoli, is squarely truncated, but is very slightly abraded. A dentary groove, which is very straight, is present on each side of the anterior two-thirds of each ramus. The mandible is 1066 in length from the tip to the parallel of both condyles, or 1085 from the tip to the end of either condyle, and the symphyseal region extends for 300, or considerably more than one quarter noted for the type of *M. mirus*. In lateral contours and in the straight external border of the anterior portion the mandible agrees fairly well with the descriptions and

[15] F. W. True, Smith. Misc. Coll., vol. 60, No. 25, 1913.

[16] F. W. True, Proc. U.S. Nat. Mus., vol. 45, 1913, pp. 651-657, pl. 52-57.

[17] S. F. Harmer, Proc. Zool. Soc., 1924, pp. 541-587.

figures of *M. mirus* published by True and Harmer, but the area between the condyle and the coronoid process is emarginated and the upper surface of the symphyseal region is concave.

The skull is 1186 mm. in maximum length, with a maximum breadth across the zygomatic processes of 520 mm., and the height from the inferior borders of the pterygoids to the vertex is 455 mm. In comparison with the skull of *M. hectori* as figured by Flower,[18] this species is much longer and shallower in the rostral region, and the post-rostral portion is relatively much broader. In the diagnostic characters of the antorbital region as set out by Harmer (1924), *M. pacificus* differs essentially from both *mirus* and *hectori*. The anterior plate of the malar is greatly expanded and covers the entire ventral surface of the prominent antorbital notch, but, unlike *M. mirus*, it does not form part of the notch itself and is well hidden from the dorsal surface although just visible from the lateral view. The styliform zygomatic processes are broken on each side. The large and greatly thickened lachrymal is a very distinctive feature. It forms a prominent part of the tubercle when seen from either the dorsal or anterior view, and also is the main constituent in the lateral view. Its rounded lateral border slopes to the ventral surface, where the flattened portion passes inwards beneath the zygomatic process of the malar.

Compared with the lateral view of skulls of *mirus*, as illustrated by True and Harmer, the lachrymal of *pacificus* is strikingly distinct, its vertical thickness being no less than 46 mm., whilst its maximum antero-posterior extent is 55 mm. This is well shown in Plate XLIII., fig. 2. The antero-ventral border of the bone is rounded, whilst the posterior portion is obliquely triangular with the apex directed upwards and backwards. On each side of the skull this element is far thicker than the overlying frontal and maxillary plates (apart from the maxillary ridge), and in this lateral development the lachrymal appears to reach in *M. pacificus* its maximum in the Ziphiidæ.

When referring to the flattened lachrymal of a young *M. grayi*, W. K. Gregory, in his study of the evolution of this element, states, "In existing odontocetes the most complete and primitive condition of the lachrymal is seen in the Ziphiinæ."[19] *M. pacificus* would appear to be a specialised species in this respect, and in view of the different interpretations of the elements of the antorbital region of other Cetaceans, as noted by Owen, Flower, Harmer, and others, this development is of interest. The lachrymal in R. Kellogg's fossil dolphin, *Xenorophus*, is relatively enormous.

In *M. pacificus* the vertex has reached a more posterior position than in either *mirus* or *hectori*, and this is an outstanding difference which is obvious when the superior cranial surfaces of the three species are viewed together. When seen in lateral outline the occipital region of *M. pacificus* is much more vertical, and the distance from the border of the foramen magnum to the

[18] W. H. Flower, Trans. Zool. Soc., x., 1878, pl. lxxi.
[19] W. K. Gregory, Bull. Amer. Mus. Nat. Hist., xlii., 1920, p. 161.

Mesoplodon pacificus Longman.

W. Sanderson, Photo.

Face page 270.

external narial orifices is relatively much contracted. The width of the expanded anterior portion of the vertex across the premaxillæ is about equal to half the width of the cranium in this region, as in *M. mirus*. The median portion of the nasals reaches the plane of the premaxillary plates. Owing to abrasion on the dorsum of the vertex, the sutures between the component parts cannot be fully traced, but the post-nasal elements are quite as extensive as the conjoined nasals. The right nasal is larger than the left. The width of the vertex behind the expanded premaxillary plates far exceeds its antero-posterior diameter, as may be seen from Plate XLIII., fig. 1, and this forms a striking distinction between *M. pacificus* and *M. mirus* and even more so with *M. hectori*. Behind the premaxillary crests the recurved plates of the maxillaries are vertical in position, but are thinner and less extensive outwardly than in *M. mirus*, as figured by Harmer.

The mesethmoid has a very prominent convex projection, attaining 50 mm. in height, at its junction with the mesorostral ossification immediately in front of the nares, and behind this is a deep vertical sinus, which is not found in *hectori*. In front of the nares the right premaxillary plate (72 mm.) is wider than the left (60), whilst at the expanded portions on the subvertical anterior face of the vertex the right plate attains 120 and the left 72.

The straight and prominent maxillary ridge is best developed on the right side, but this region is partly abraded on the left. This ridge is almost parallel with the median line of the skull, resembling that of *M. europœus*, and is not directed obliquely outwards as in *M. mirus*. From the lateral view its dorsal border is evenly convex, and in transverse section it is acuminate.

There is no noticeable inner notch but an even curve at the base of the rostrum in front of the prominent antorbital notch. The mesorostral ossification is confined to the basal portion of the rostrum and extends only 110 mm. beyond the line of the antorbital notches. The maxillary foramina are much enlarged (40 x 16 mm.), resembling those of *Berardius arnuxii*, whilst the premaxillary foramina, which are more anteriorly situated, are unequal in position, the left being considerably in advance of the other. The last-named foramina open into a groove in each premaxilla, which is deep but not extensive. In the median part of each lateral expansion of the vertex there is a prominent double foramen between the premaxillary and maxillary plates. These foramina open into the nares on either side of the mesethmoid.

The rostrum itself is relatively wider and less deep than that of either *M. mirus* or *hectori*, and in this respect resembles that of *M. bidens* as figured by True[19a] and by van Beneden and Gervais in "sowerbiensis." The maxillary flange on each side is a very prominent character. This commences in front of the maxillary ridge, and here for a short distance the outer edge is raised considerably above the level of the median portion of the rostrum. As it proceeds forward it slopes downwards until it ends on the ventral surface at

[19a] F. W. True, Bull. 73, U.S. Nat. Mus., 1910, pl. 7.

the anterior point of the maxilla in the terminal fourth of the rostrum. The infero-lateral region of each flange is marked by a narrow dentary groove, which is also continued to the tip of the rostrum.

With the exception of the curved basal portion of the lateral flange, the rostrum is very straight on its superior border, when seen in lateral outline (Plate XLIII.). There is here a superficial resemblance to *M. grayi*, as figured by Flower and Hector, but it has no close affinity with this species.

On the ventral surface the vomer appears at 248 mm. from the apex of the rostrum. It is bordered by a longitudinal groove on each side and is also preceded by a median groove between the premaxillæ. The rostrum is very shallow in the region of the vomer. After being visible for 330 mm. the median element disappears beneath the thickening plates of the maxillæ. The pterygoid region is somewhat damaged and abraded. The sutures with the palatines cannot be traced positively between the anterior pterygoid wings.

The basioccipital region resembles in its main features *M. mirus* as described by True and Harmer. The anterior halves of the ridges are strongly convergent and are continuous with the posterior lateral portions of the pterygoid. No periotic bones are preserved.

The anterior ends of the zygomatic processes of the squamosal are not so truncated as in *M. mirus*.

When compared with the illustrations of skulls of *Berardius* published by True (*loc. cit.*, 1910), C. A. Marelli[20] and earlier writers, it is obvious from the architecture of the vertex and other features that our specimen is a *Mesoplodon* and not an anomalous *Berardius* in which the second pair of teeth is missing.

Table of Measurements in Millimetres.

Skull, total length	1,186
Height, inferior borders of pterygoids to vertex	455
Width across zygomatic processes	520
Width across occipital condyles	160
Length of rostrum from level of bases of antorbital notches	815
Width of rostrum between bases of antorbital notches ..	335
Height of rostrum at middle	60
Width of rostrum at middle	160
Width of premaxillæ across expanded ends at vertex ..	241
Superior nares, greatest width	89
Mandible, length of ramus to end of condyle	1,085
Mandible, length of symphysis	300
Mandible, maximum height at coronoid	187

[20] C. A Marelli, Annales del Mus. Hist. Nat. Buenos Aires, xxx., 1920, pp. 411-444, pl. i.-v.

The single apical pair of teeth is so distinctive a feature that Oliver has erected the genus *Paikea*[21] to accommodate *hectori* and *mirus*. Harmer, however, has pointed out the difficulties associated with this course, as *hectori* and *mirus* differ from each other in certain respects and the last-named is obviously allied to *M. europæus*, in which the teeth are near the posterior end of the symphysis.

Probably each new specimen to be received will add to our knowledge of the variation of these remarkable Cetaceans, which appear to be still undergoing a process of rapid evolution. The differences between *M. pacificus* and its allies, however, are too significant to be merely individual or due to age.

In his interesting review of the inter-relationships of the Cetacea, the late Herluf Winge (as translated by G. S. Miller) considers the short, broad cranium as the result of water pressure moulding the plastic elements, and the extreme development in the Xiphiines as due "to swifter, more violent swimming than other whales." Winge's views, which are here very condensed, are suggestive, and the extraordinary diversity of cranial architecture in this group is surely the result of such evolutionary processes. G. S. Miller (1923) has pointed out the probable significance of water pressure on the skulls of rapid-swimming mammals that are "born in the water."[21a]

Mesoplodon pacificus is extremely brachycerebric. An attempt to estimate the size of the cranial cavity, with inside calipers, shows an approximate length from the upper margin of the foramen magnum to the region of the degenerate cribriform plate (which is not perforated) of 155 mm., whilst the maximum breadth is about 260. There is a prominent vertical tentorial plate. The capacity of the brain case, as measured with fine sand, is 5,400 cubic centimetres. The minimum transverse diameter of the supra-occipital region to the margins of the temporal fossæ is 325.

Judging from the recorded proportions of other species, the skull of *M. pacificus* represents a beaked whale of at least 25 feet in length. It appears to be the largest skull yet recorded for the genus.

LIST OF QUEENSLAND CETACEA.

The following species are represented in the Museum :—

MYSTACOCETI.

HUMP-BACK WHALE : Megaptera nodosa Bonnaterre (including *M. longimana* and *boops*).

The Queensland Museum is indebted to Mr. Thomas Welsby for the skeleton of a specimen about 35 feet in length, which was stranded on Stradbroke Island, to the east of Amity Point, in August, 1919. (J. 3343.)

SULPHUR-BOTTOM WHALE : Balænoptera musculus (Linnæus) (including *B. australis*).

Remains of skeleton without data.

[21] W. R. B. Oliver, Proc. Zool. Soc., 1922, p. 574.

[21a] G. S. Miller, Smith. Misc. Coll. vol. 76, No. 5, 1923.

ODONTOCETI.

SPERM WHALE: Physeter macrocephalus Linnæus.

Apart from many teeth, the only specimen representing the Sperm Whale is an incomplete maxilla, collected at Bushy Islet, Hannibal Islands, N.Q., and presented by Captain T. M. Almond. (D. 8522.)

PYGMY SPERM WHALE: Kogia breviceps (de Blainville).

Recorded in this paper.

Family Ziphiidæ.

CUVIER'S BEAKED WHALE: Ziphius cavirostris Cuvier.

An incomplete skeleton of this whale was stranded at Nikenbah, near Maryborough, in 1918, and presented by Mr. Emil Jensen. It was placed on record by the writer in 1919.[22]

BEAKED WHALE: Mesoplodon densirostris (de Blainville).

Recorded in this paper.

LAYARD'S BEAKED WHALE: Mesoplodon layardi (Gray).

A skull and a few vertebræ were obtained from a specimen stranded at Zilzie, near Emu Park, Rockhampton, in 1884. (J. 2105.) A note regarding its identification by C. W. De Vis as *Mesoplodon layardi* was published by W. N. Jaggard in 1885.[23]

A specimen stranded near Southport, also in 1884, was tentatively recorded by De Vis as *Ziphius layardi*,[24] but no report on the skull and other bones appears to have been published. This whale was 12 ft. 4 in. in length, and was mounted with the skull in the Museum, where it is still on exhibition. In the circumstances, no satisfactory examination can be made of the hidden skull. No raised teeth can be traced in the mandible.

BEAKED WHALE: Mesoplodon pacificus Longman.

Recorded in this paper.

Family Delphinidæ.

PILOT-WHALE or "BLACKFISH": Globicephala melæna (Traill).

This species is represented by two crania, one of which (J. 3820) comes from Fraser Island (presented by Mr. N. D. Allom). Judging from crania alone, the "blackfish" stranded in Madura Strait, Java, recorded by K. W. Dammerman as Blyth's *G. indica*,[25] are closely allied to our species. I have

[22] H. A. Longman, Proc. Roy. Soc. Qld., xxxi., 1919, pp. 90-93, pl. iii. and iv.

[23] W. N. Jaggard, Proc. Roy. Soc. Old., i., 1885, p. 58.

[24] C. W. De Vis, Proc. Roy. Soc. Qld., i., p. 174, pl. xix.

[25] K. W. Dammerman, Treubia, vol. v., 1924, pl. vi.-viii.

preferred to use the specific name of the older species, which most authorities recognise as cosmopolitan, as I have no record of the colours of our specimen in life.

FALSE KILLER WHALE: Pseudorca crassidens Owen.

The late Mr. J. H. Stevens, Inspector of Fisheries, presented a skull with lower jaw of this Cetacean to the Museum in 1913. (J. 937.) The locality is stated to have been near Townsville, Queensland.

COMMON DOLPHIN: Delphinus delphis Linnæus.

This is represented by a skull with remains of the skeleton from Moreton Bay. (J. 2776.)

BOTTLE-NOSED DOLPHIN: Tursiops catalania (Gray).

This species is represented by several skulls, skeletal material and two mounted specimens. The localities range from Townsville in the north to Burleigh Heads. This appears to be the most common dolphin on our coast.

? OWEN'S DOLPHIN: Sotalia gadamu (Owen).

Two of our skulls have been identified as this species, which has been recorded for Australia by Flower[26] and Ogilby.[27] At present the writer is not satisfied with the separation of this material from *T. catalania*. There is considerable variation in the region of the pterygoids and according to True the number of teeth in *T. catalania* varies from 21 to 28. True also notes that the skull of *Sotalia gadamu* "shows decided affinities to *Tursiops*, from some species of which, were the pterygoids united, it would be very difficult to distinguish it."[28] In our specimens the antorbital region slopes obliquely away from the notch, and this appears to be a distinguishing feature from the type of *Delphinus gadamu* as figured by Owen.[29]

A skeleton of the Speckled Dolphin, *Sotalia lentiginosa*, is also present in the collections, and is probably from our waters but there is no locality data. This species, as figured by Lydekker,[30] is distinctively spotted when adult.

Coloured casts of models of species of *Balæna*, *Balænoptera*, *Megaptera*, and *Rhachianectes*, received in exchange from the American Museum of Natural History, New York, are on exhibition in the Public Galleries.

ABORIGINALS AND "PORPOISES."

In view of the references in literature to the supposed co-operative association in fishing in early days of Queensland Aboriginals with "porpoises," I have thought it of interest to review the observations on this curious subject.

[26] W. H. Flower, Proc. Zool. Soc., 1883, p. 489.
[27] J. D. Ogilby, Catal. Austr. Mamm., Aust. Mus., 1892, p. 77.
[28] F. W. True, Bull. 36 U.S. Nat. Mus., 1889, p. 14.
[29] R. Owen, Trans. Zool. Soc., vi., 1869, pl. iv.
[30] R. Lydekker, Proc. Zool. Soc., 1908, pp. 802-808, pl. xlv.

The dolphins found on our coast are invariably called "porpoises," and presumably the species mentioned in the following references is *Tursiops catalania*. At the present time owing to the prevalence of motor boats these Cetaceans are less common in Moreton Bay than in the past.

As considerable scepticism naturally exists as to the reality of this co-operative association, several extracts will be given. In the Proceedings of the Zoological Society for 1856, p. 353-4, there appeared a short article by Mr. Fairholme entitled "The Blacks of Moreton Bay and the Porpoises," which is as follows :—

> "Between the two islands which form the south part of Moreton Bay, is a passage known as South Passage, formerly used for ships entering the Bay, but now given up. Near the deserted Pilot Station at Amity Point, some of the natives may constantly be found during the warmer months of the year fishing for 'mullet,' a very fine fish about the size of a mackerel. In this pursuit they are assisted in a most wonderful manner by the Porpoises. It seems that from time immemorial a sort of understanding has existed between the blacks and the porpoises for their mutual advantage, and the former pretend to know all the porpoises about the spot, and even have names for them.
>
> "The beach here consists of shelving sand, and near the shore are small hillocks of sand, on which the blacks sit, watching for the appearance of a shoal of mullet. Their nets, which are used by hand, and are stretched on a frame about 4 feet wide, lie ready on the beach. On seeing a shoal, several of the men run down, and with their spears make a peculiar splashing in the water. Whether the porpoises really understand this as a signal, or think it is the fish, it is difficult to determine, but the result is always the same : they at once come in towards the shore, driving the mullet before them. As they near the edge, a number of the blacks with spears and hand-nets quickly divide to the right and left, and dash into the water. The porpoises being outside the shoal, numbers of fish are secured before they can break away. In the scene of apparent confusion that takes place, the blacks and porpoises are seen splashing about close to each other. So fearless are the latter, that strangers, who have expressed doubts as to their tameness, have often been shown that they will take a fish from the end of a spear, when held to them.
>
> "For my own part I cannot doubt that the understanding is real, and that the natives know these porpoises, and that strange porpoises would not show so little fear of the natives. The oldest men of the tribe say that the same kind of fishing has always been carried on as long as they can remember.
>
> "Porpoises abound in the Bay, but in no other part do the natives fish with their assistance."

A somewhat similar account is given by George Watkins in the Proceedings of the Royal Society of Queensland, vol. viii., 1891, p. 45, who says: "The co-operative principle was so well understood between these fellow-adventurers, that an unsuccessful porpoise would swim backwards and forwards on the beach, until a friend from the shore waded out with a fish for him on the end of a spear."

Apparently the earliest record is that of James Backhouse, who states: "The blacks do not kill the porpoises because they show where there are fish to be caught." Mr. Thomas Welsby, to whom I am indebted for this reference, says that this was written on the 11th April, 1836, when Backhouse and his friends were at Amity Point. (J. Backhouse, "A Narrative of a Visit to the Australian Colonies," London, 1843, p. 368.)

Mr. Welsby also refers me to the account given by John Campbell, written first for the "Ipswich Observer," but printed as a pamphlet in 1875 under the title "The Early Settlement of Queensland and other Articles." The writer states that he was at first incredulous, but records his observations as an eye-witness at Amity Point, which are substantially the same as those given by Fairholme.

During the anchorage of the "Rattlesnake" off Moreton Island in 1847, John Macgillivray had an opportunity of making notes on the "Porpoise" of Moreton Bay. He refers to this as "an undescribed porpoise, a specimen of which, however, I did not procure, as the natives believed the most direful consequences would ensue from the destruction of one; and I considered the advantages resulting to science from the addition of a new species of *Phocæna*, would not have justified me in outraging their strongly expressed superstitious feelings on the subject. We observed that whenever a drove of these porpoises came close inshore, a party of natives followed them along the beach, and when a shoal of fish, endeavouring to avoid their natural enemies, approached within reach, the blacks rushed out into the water with loud cries, and, keeping their bag nets close together so as to form a semicircle, scooped out as many fish as came within reach." (Narrative Voyage Rattlesnake, i., 1892, p. 48.)

In "Tom Petrie's Reminiscences," dating from 1837 (published in Brisbane, 1904) his daughter records (p. 70) that one old porpoise was well known and spoken of fondly and the blacks regarded him as "the big fellow of he tribe of porpoises. I [Tom Petrie] have seen this creature take fish from a spear, and the white men working on the island told me that they often saw him knocking about with the blacks."

Another reference to this particular "porpoise" is to be found in "The Genesis of Queensland," by H. S. Russell, 1888, p. 290, where it is stated to be "as tame—with those blacks—as a pussy cat." Russell states that this scene was so curious "that the evidence of my own senses alone permits me to mention it." I am indebted to Dr. E. Sandford Jackson for the last two references.

Mr. Thomas Welsby in his book "Schnappering," published in Brisbane in 1905, says (p. 81) :—

> "I remember witnessing a great scene of fun and excitement on the haul right in front of the reserve at Amity Point. A large school of mullet were coming in along the shore, but were too far out in the deep water for the blacks, when a number of porpoises were observed rolling about fully 500 yards away, and sunning themselves, in complete unconsciousness of the feast so near them. One blackfellow went down to the beach with a spear, which he prodded into the sand several times, and then struck the water with it at full length and flat along it or horizontally. Instantly the porpoises answered the signal by dashing in and, of course, driving the poor mullet before them, when there was a rush of about twenty natives into them with their nets, and for the next few minutes nothing was to be seen but a confused mass of fish, porpoises and blacks, all mixed up together, out of which the blacks emerged with their nets as full as they could hold, and left the balance of the school to be worried by their curious allies."

The average reader may be sceptical and suggest that the association may be explained concisely by the old adage: *post hoc, ergo propter hoc.* Mr. Welsby, however, who is one of the keenest of fishermen, says, "It is very easy to understand how the two came to work together in the strange way they did, for the porpoise is a very intelligent creature, and he soon found out that attendance on the blackfellow meant fish for him."

In view of the many observations made by different persons it appears that there is a good case for this remarkable illustration of commensalism.

[*END OF* VOL. VIII., *MEMOIRS OF THE QUEENSLAND MUSEUM.*]

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